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MARCH

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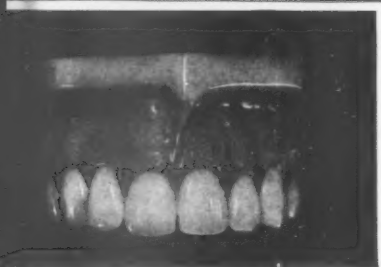

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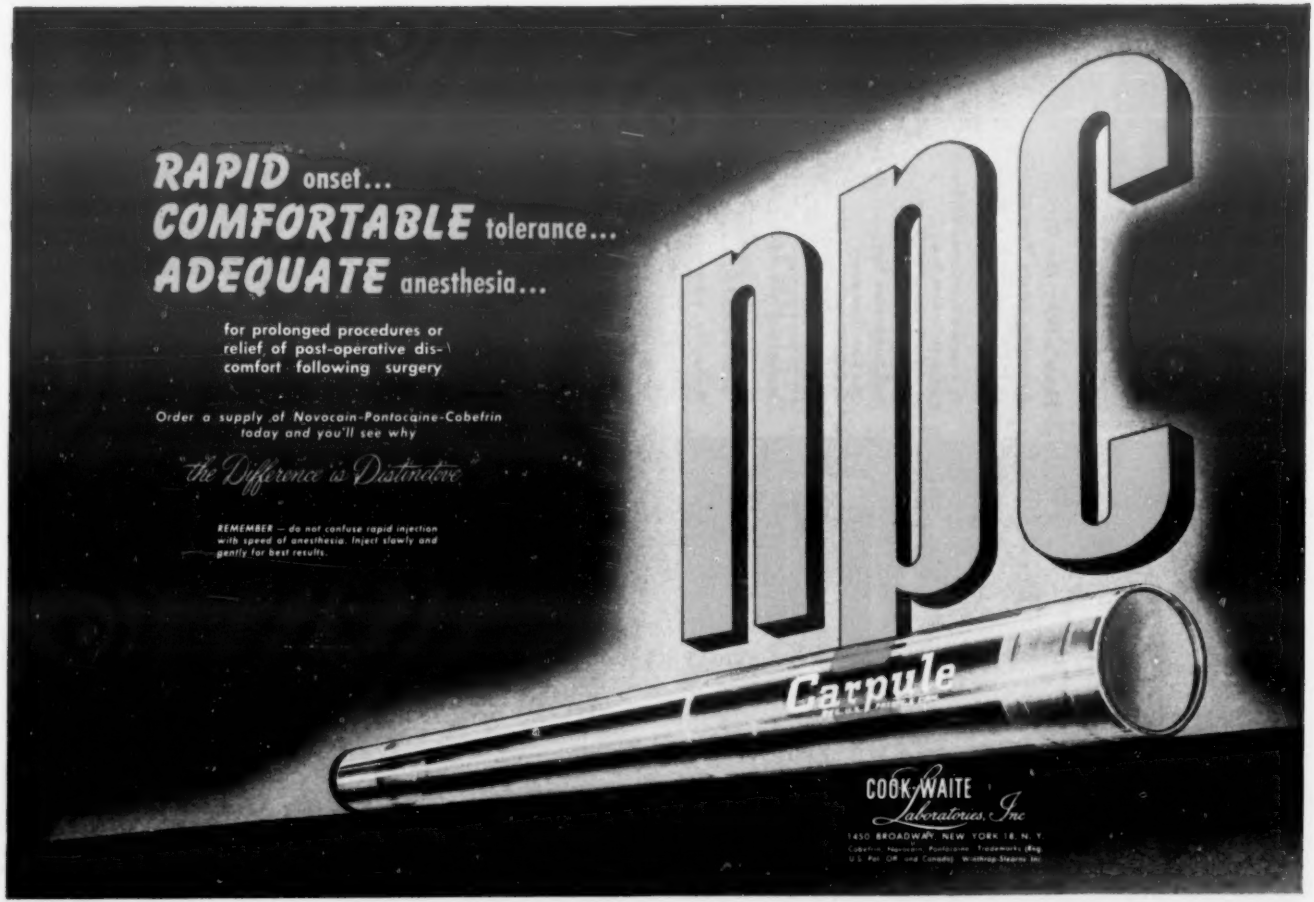
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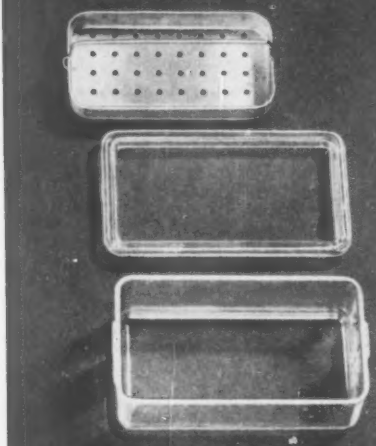

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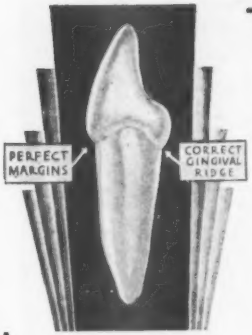

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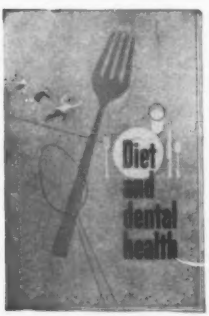

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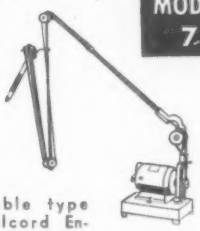

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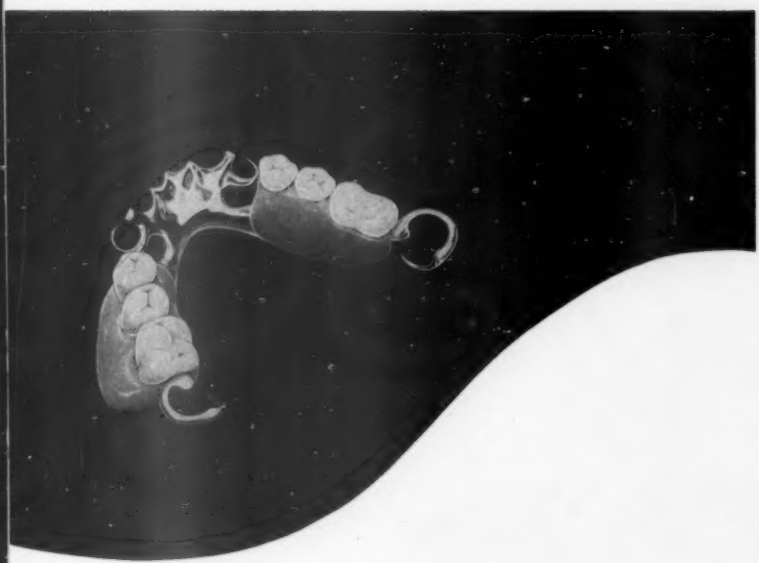

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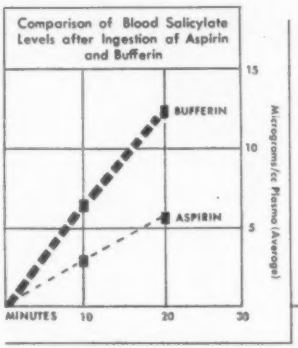

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1. Effect of Buffering Agents on Absorption of Acetylsalicylic Acid. J. Am. Pharm. Assoc., Sc. Ed. 39:21, Jan. 1950
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MARCH 1952 VOLUME 44 • NUMBER 3

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Auto-polymerizing resin fillings

Herbert D. Coy, D.D.S.; David M. Bear,† D.D.S., and Seymour J. Kreshover,‡ D.D.S., M.D., Ph.D., Richmond, Va.*

For many years the dental profession has searched for an ideal filling material for the anterior teeth; one that is noninjurious to the pulp and also combines certain of the qualities of gold foil and the esthetics and ease of insertion of the silicate cements.

Too little is known yet about the direct filling acrylic resins to conclude that they meet the stated requirements but those who have worked with them during the short time they have been available are encouraged to believe that they have possibilities for becoming a satisfactory restorative material.

The self-hardening dental resins first made their appearance in Germany between the years of 1936-1941[1] and the first German patents were issued in the latter year. Interest was intensified because of the shortage of suitable metals during and following World War II. During this experimental period it soon was recognized that maintenance of pressure during polymerization was necessary in order to minimize porosity and shrinkage. However, since the process of polymerization was induced by applying external heat, such as from a hot spatula or an infra-red lamp, the operation of applying pressure at the same time proved a difficult one.

In later years chemicals were added to induce polymerization by catalytic action. Such action produced the desired polymerization but resulted in a volume shrinkage of from 6 to 8 per cent depending primarily on the liquid-pow-

Presented in a symposium before the Section on Operative Dentistry, ninety-second annual session of the American Dental Association, Washington, D. C., October 16, 1951.

*Professor of operative dentistry and director, dental clinic, Medical College of Virginia, School of Dentistry.

†Associate in operative dentistry, Medical College of Virginia, School of Dentistry.

‡Professor of oral pathology and director, dental research, Medical College of Virginia, School of Dentistry.

1. Blumenthal, L. M. Recent German developments in the field of dental resins, Fiat, Final Report No. 1185, May 27, 1947, Washington, D. C., Department of Commerce, Office of Technical Services.

der ratio. This was demonstrated by workers at the National Bureau of Standards who further showed that the shrinkage lacked uniformity, being concentrated where resin was free to move as hardening occurred. Part of this shrinkage was observed to take place before the material was placed in the cavity, but subsequent moisture absorption caused compensation to the degree of approximately 20 per cent. It has been recognized that the faster setting acrylics have a greater amount of shrinkage and less tendency to flow under stress than do the slower setting materials. However, since their use in stress-bearing areas is contraindicated, the slight difference in flow has little significance in the service of the filling.

Another significant accompaniment of polymerization of the fast setting acrylics is the production of heat. It was thought at first that this might cause severe damage to the pulp. However, tests carried out at the National Bureau of Standards[2] discount this possibility on the grounds that the generated heat is not excessive in the small amount of material required for the average cavity.

It is believed that the polymerization or curing process of acrylic resins is achieved by decomposing the benzoyl peroxide (catalyst) on heating, thus releasing free oxygen radicals which appear to initiate a chaining of monomer molecules. In the self-curing resins this decomposition of catalyst is produced by adding a tertiary amine (activator) to the monomer; the rate of polymerization being proportional to the amount of catalyst and activator used.

Because the amines used as an activator have a tendency to discolor on oxidation, there is a tendency for all self-curing resins to discolor or take on a yellowish hue. Such discoloration will vary according to the type of amine used and the amount introduced into the mixture.

It is the purpose of this paper to report certain clinical and experimental findings that might further understanding of this relatively new filling material and encourage its more discriminatory use by the dental practitioner.

MATERIALS AND METHODS—CLINICAL STUDY

Approximately 600 restorations made with self-polymerizing acrylic filling materials in human teeth were surveyed at the Medical College of Virginia Dental Infirmary over a 16 months' period. An average of two fillings were placed in the mouth of each patient. A rapid hardening type (designated Acrylic A) and a slow hardening type (designated Acrylic B) were used in this study. At its inception, demonstrations by manufacturers' representatives were observed and their instructions critically reviewed. Shortly thereafter it became apparent that certain essential modifications in technic were indicated.

Articles have appeared in dental journals and advertising claims have been made by manufacturers that the self-curing acrylics are suitable for all types of restorations. However, because of their propensity to flow under stress, restorations with this material should be limited to the Class III and Class V type cavities. Their use should be further restricted to those cavities where pressure may be applied and maintained during polymerization.

In the Class III type preparations, margins should be placed, if possible, in self-cleansing areas. However, care should be taken not to leave a margin in contact with an approximating tooth. It should be remembered that resinous materials are soft in comparison to any type of gold. Thus, the rule of eliminat-

2. Wolcott, R. B.; Paffenbarger, G. C., and Schoonover, I. C. Direct resinous filling materials: temperature rise during polymerization. J.A.D.A. 42:253 (March) 1951.

ing unsupported enamel rods in cavities designed for gold restorations need not be rigidly adhered to in preparations for an acrylic filling. This is because unsupported enamel is apt to be more desirable in non-stress-bearing areas than a larger cavity created by removal of such enamel rods. Furthermore, the smaller the cavity the easier it is to apply a matrix, to maintain its pressure for longer periods and to restore normal tooth form. The cavosurface of any cavity prepared to receive a self-curing resin is not beveled.

A Class III cavity prepared to receive a gold foil filling usually has three definite and well defined points of retention. On the other hand, a proximal cavity designed to receive an acrylic filling should be so prepared that the cavity proper is larger than the orifice. In this manner resistance will be offered from every possible direction.

No adhesion exists between self-curing resins and cavity walls. Thus, when the material is properly confined to the cavity, shrinkage will take place in the base of the cavity and will have a tendency to pull away from any existing sharp undercuts. Because of this phenomenon and the fact that the self-curing resins flow and consequently adapt better to a concave type of preparation for retention, sharp undercuts should be avoided. In some cases this can be accomplished best by the use of round burs or diamond instruments instead of the wheel type or the inverted cone.

The principles that apply to a Class III cavity are applicable also to the Class V preparation. As previously stated, the surface outline should be extended to a minimum and all the cavity walls should be tapered so that the inside of the cavity is larger than the orifice. This type of undercut need not be as sharply defined as for gold foil or amalgam since the retention of the acrylics depends on the whole mass being retained. For retention, gold foil is wedged so as to compress the dentin. Amalgam, on the other hand, expands to help lock itself into the cavity. The self-curing resins differ from both of these filling materials in that they shrink during polymerization and their retention, therefore, depends on the entire cavity being undercut and pressure being maintained during setting.

Although the powder-liquid ratio varies somewhat with the different brands of material, it should be borne in mind that the object is to saturate all the polymer with monomer. It is essential to employ the minimum amount of monomer that will produce saturation since it is this fraction that causes shrinkage. A further requirement in preparation of the mix is to keep spatulation to a minimum since repeated folding over of the material tends to entrap air, thereby creating a porosity on the surface which cannot be properly finished. In addition to the better finished surface afforded by a denser mix, there will be far less tendency to discolor. When the proper mix is made, preferably in a jar or dappen dish, and polymerization has progressed to the point where it will retain an indentation made with the edge of a spatula, it is ready to place in the cavity.

Undercuts should be filled first with small portions carried on a suitable plastic instrument; then the entire mass may be carried to the cavity and forced to place.

After inserting the mix the matrix should be adjusted and tightened to exert a definite pressure. This should be maintained for a minimum of eight minutes for the faster setting resins and 10 minutes for the slower setting resins. Also, the smaller the filling the slower is the curing process and the longer the matrix should be held in place. Matrix application by finger pressure alone is not practicable.

Several types of useful matrix retainers are on the market. Those found most useful in our hands are the Formatrix, the McAfee, the Tofflemire Anterior, the Muckle and the Strip-Tite.

der ratio. This was demonstrated by workers at the National Bureau of Standards who further showed that the shrinkage lacked uniformity, being concentrated where resin was free to move as hardening occurred. Part of this shrinkage was observed to take place before the material was placed in the cavity, but subsequent moisture absorption caused compensation to the degree of approximately 20 per cent. It has been recognized that the faster setting acrylics have a greater amount of shrinkage and less tendency to flow under stress than do the slower setting materials. However, since their use in stress-bearing areas is contraindicated, the slight difference in flow has little significance in the service of the filling.

Another significant accompaniment of polymerization of the fast setting acrylics is the production of heat. It was thought at first that this might cause severe damage to the pulp. However, tests carried out at the National Bureau of Standards[2] discount this possibility on the grounds that the generated heat is not excessive in the small amount of material required for the average cavity.

It is believed that the polymerization or curing process of acrylic resins is achieved by decomposing the benzoyl peroxide (catalyst) on heating, thus releasing free oxygen radicals which appear to initiate a chaining of monomer molecules. In the self-curing resins this decomposition of catalyst is produced by adding a tertiary amine (activator) to the monomer; the rate of polymerization being proportional to the amount of catalyst and activator used.

Because the amines used as an activator have a tendency to discolor on oxidation, there is a tendency for all self-curing resins to discolor or take on a yellowish hue. Such discoloration will vary according to the type of amine used and the amount introduced into the mixture.

It is the purpose of this paper to report certain clinical and experimental findings that might further understanding of this relatively new filling material and encourage its more discriminatory use by the dental practitioner.

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Several types of useful matrix retainers are on the market. Those found most useful in our hands are the Formatrix, the McAfee, the Tofflemire Anterior, the Muckle and the Strip-Tite.

The first two matrix retainers are designed for Class V cavities. Following the preparation the cavity is filled flush to the enamel margin with baseplate gutta-percha. A modeling compound impression of the restored tooth surface is taken and the impression lined with tin foil. The temporary filling is then removed, the cavity filled with acrylic material and the matrix applied under the tightened clamp.

Some clinicians recommend the use of inlay wax instead of baseplate gutta-percha to restore tooth form after the cavity is cut. However, since wax is difficult to remove from the margins and since it is not compatible with acrylic resins, the minutest amount preventing a bond between two portions of resin, it may prevent a close contact between the cavity margin and the resin filling. Therefore, a more inert material like baseplate gutta-percha is superior for the purpose. In those cases where the tooth to be restored possesses surface continuity, the impression may be made before the cavity is cut.

The other types of matrixes mentioned are for Class III restorations and are easily adjusted according to the directions of the manufacturer.

The importance of holding the acrylic filling materials under pressure while they are polymerizing cannot be stressed too strongly. Unless this can be done, some other type of filling material should be used.

The matrix should be so adjusted as to permit a surplus of resin to cover the margins. This surplus not only helps to maintain pressure but minimizes surface shrinkage. The resultant flange should not be removed until the time of final finishing, at least 24 hours later. Some manufacturers have recommended finishing in from 10 to 20 minutes. However, the physical properties of self-curing acrylics do not indicate such a procedure since the curing process is not completed for nearly 24 hours.

If necessary, wedges should be employed to insure a minimum of surplus at the gingival margin of Class III cavities. Excessive amounts of material create the hazard of loosening the filling when the surplus is removed.

The finishing of the proximal surface of Class III fillings is best done with a thin bladed sharp knife. This is a whittling operation and thin bites should be taken with the knife to avoid dislodging the filling. The labial flange can be reduced with a medium garnet paper disk or with a plain cut fissure bur or a flame type surgical bur held lightly against the surface. The lingual surface can be reduced with a large round bur held lightly against the material in a manner that will shave the surface and not cut deeply. The surfaces then can be smoothed with sandpaper strips and wet disks and the final finish can be enhanced by the use of wet chalk on a buff wheel.

Considerable interest has developed recently in a new nonpressure technic for inserting auto-polymerizing resinous materials in cavities. This technic was presented for the first time before the 1951 meeting of the International Association for Dental Research by Frank Nealon.

There has been insufficient time to completely evaluate this technic in our clinic. Approximately 100 fillings have been inserted, and in the relatively brief period they have been under observation, there is an indication that they are the equal of, if not superior to, any we have placed with the pressure method.

The technic for insertion with a brush is a simple one. Monomer and polymer are placed in separate dappen dishes—the monomer being kept warm by placing it on the outer rim of a mica-tray suspended over an alcohol lamp. It is essential to maintain an optimum temperature since polymerization will occur if heat is excessive. The point of a 00 sable brush is moistened in the monomer and thence transferred to the polymer so as to pick up a small bead of powder which is then

painted into the cavity. Intervals of 40 to 60 seconds between applications are allowed in order to permit the material to partially polymerize and afford time for shrinkage to take place.

In the "painting" technic, as in the pressure method, care should be taken to use the minimum amount of monomer that will saturate the polymer. In our hands this method seems to require a less retentive cavity than does the pressure technic. The finishing procedure is the same for both.

CLINICAL OBSERVATIONS

In appraising various filling materials, G. V. Black[3] once said that the supreme test of any filling material is its ability to hold a margin. Thus, it is necessary to consider the clinical evidence in order to properly evaluate the self-curing resins. However, there is insufficient data available in the short time they have been in use to write the final verdict. It is possible only to formulate conclusions from the observations which have been made thus far.

Of the approximately 300 patients who received treatment in connection with this study it was possible to recall 50 for observation after three months and 40 after one year. The observations are recorded in the accompanying table. Several fillings which became loose in the finishing operation at the inception of this study were replaced and, therefore, were not included in the presented data.

Four fillings were found to be loose at the time of the first re-examination. These were replaced. No restorations were observed to be loose at the one year examination period. A total of 15 fillings were found to be discolored at the margins and in the body of the filling, which indicated a porosity probably caused by faulty mixing and insufficient pressure maintenance during polymerization. At both check-up periods roentgenograms were made of all teeth and their pulps were tested for vitality. In all instances the findings were within normal limits.

Table • Clinical observations one year after insertion

Material used	Total restorations	Pulp deaths	Leakage	Stained or discolored	Number replaced for all causes
Acrylic A	60	4	2	9	11
Acrylic B	45	1	2	6	8
Total	105	5	4	15	19

At the one year re-examination date, fillings were removed from 10 patients in order to determine the adequacy of seal. The fillings selected for removal (5 Acrylic A restorations and 5 Acrylic B restorations) showed no grossly demonstrable defects except for some slight discoloration. The teeth were isolated with a rubber dam and the fillings were removed carefully under the observation of a member of the clinical staff. The conditions under these fillings seemed to be satisfactory. There was no apparent difference from what might be expected under any other filling material. Furthermore, there was no apparent tendency toward solubility in the fluids of the mouth. In this respect the resinous filling materials have great superiority over silicate cement.

The five pulp deaths recorded occurred within a period of a few days following insertion of the fillings. These teeth previously had been the seat of deep carious lesions and consequently death might have resulted following the use of any filling material. In no case was a zinc phosphate cement base used. However, the cavity lining recommended by the manufacturer was used in the four Acrylic A restorations. It is our present practice to employ a cement base over

3. Black, G. V. Operative dentistry, Vol. 2. Chicago, Medico-Dental Company, 1908, p. 224.

calcium hydroxide in all deep seated cavities. No pulp deaths have come to our attention since this procedure was instituted. In cavities of normal depth no liner was used. It should be emphasized at this point that oils, such as phenol or eugenol, inhibit polymerization and, consequently, their use should be avoided. Should it be necessary to employ zinc oxide and eugenol in deep cavities, a cement covering should be placed prior to insertion of a resin.

In an effort to evaluate the status of pulpal tissues in teeth filled with certain of the self-polymerizing acrylic resins, a series of experimental observations were made.

MATERIALS AND METHODS— EXPERIMENTAL STUDY

A total of 72 cavity preparations were made in a like number of teeth of 4 dogs of approximately the same age. In so far as possible, all operative procedures were standardized so as to duplicate cavity size and depth and rapidity of instrumentation. Other factors relative to handling and preparation of the restorative materials were controlled and were according to the directions of the manufacturers.

The experimental procedure was to complete four gingival third cavity preparations at each specified interval period during the course of the experiment. These were filled with four different materials: paraffin sealed with oxyphosphate of zinc cement, Acrylic A (with liner supplied by manufacturer), Acrylic A (without liner), and Acrylic B. Time intervals from insertion of restorative materials to animal sacrifice ranged from 1 to 14 days. The teeth were removed intact in their respective alveolar structures by means of a bandsaw and then were ground by stone until the apical pulps were exposed. Following fixation, decalcification and embedding in celluloid, longitudinal sections were cut serially, mounted and stained with hematoxylin and eosin.

EXPERIMENTAL OBSERVATIONS

Many of the prepared sections were deemed technically unsatisfactory for adequate histologic study. Consequently, the over-all number of completed cases was somewhat less than the number initially prepared for examination. Nevertheless, an appreciable number of specimens were studied to afford a general impression of the nature of pulpal response to the tested filling materials.

In general, all the tested restorative materials, with the exception of paraffin, were associated with some degree of pulpal irritation. Figure 1 is a representative section of a tooth filled with a base of paraffin and sealed with cement for a period of four days. The apparent absence of pathologic change also is demonstrable in other time interval specimens of similarly treated teeth. Figure 2,A is a section from an upper right first molar filled with Acrylic B for 24 hours. The pulp area shown underlies cut dentinal tubules coursing from the base of the cavity preparation. It can be seen that the predentin zone is of adequate width, not differing appreciably from other areas in the same tooth. An intact layer of odontoblasts has receded somewhat from the predentin. Present in this separated zone is an accumulation of polymorphonuclear leukocytes and small lymphocytes. Also seen in the odontoblastic layer are a number of engorged capillaries. The remaining portion of the pulp, not underlying the cavity preparation (Fig. 2,B), is of essentially normal appearance with an intact, nonreceded, odontoblastic layer of cells.

A somewhat different picture is seen in those teeth filled with Acrylic B for longer periods of time. For example, at the end of four days there is observed frequently a definite vacuolization of the odontoblastic layer. This is apparent in

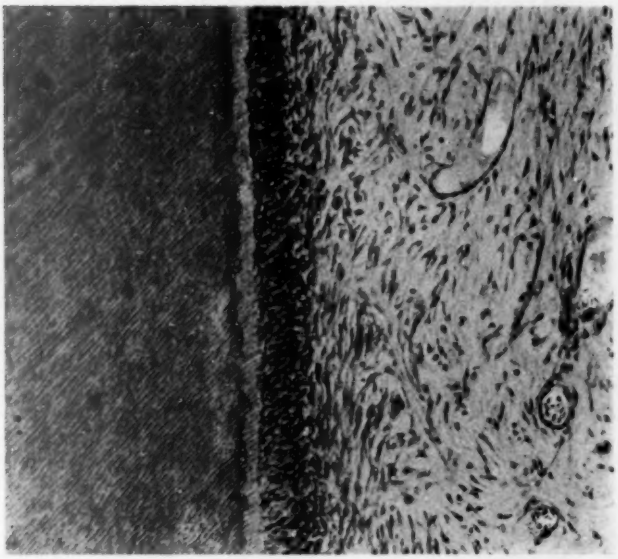

Fig. 1 • Lower right third bicuspid. Showing normal pulp tissue underlying cut dentinal tubules of cavity filled with paraffin for four days

Figure 2,C where the change is not only present on the cavity side of the section but also on the nonoperated side. However, in the former region, an appreciable degree of pulpal hemorrhage is present, as well as a large, cyst-like formation. This latter finding, however, may represent artefact. At longer time intervals, namely, from 12 to 14 days, there is little evidence of pathologic change other than hyperemia and interstitial hemorrhage.

A similar sequence of histologic change is observed in those teeth filled with Acrylic A following the application of a cavity varnish furnished by the manufacturer. A typical example may be seen at the four day period (Fig. 3,A). The pulp of this upper left second bicuspid is essentially normal in all regions except in the area underlying the cut dentinal tubules. Here the odontoblastic layer is vacuolated and contains many engorged capillary vessels. The subjacent pulp is hyperemic and there is a suggestion of early reticular atrophy.

In the case of Acrylic A fillings, placed without a cavity liner, the histologic changes are minimal in degree with little variation from the 1 day to 14 day period specimens. A typical pulp picture is shown in Figure 3,B where odontoblasts are seen as an intact, uniform layer of cells, and the underlying tissue shows little evidence of pathologic change other than a questionable degree of vascular engorgement.

It must be stated, in evaluating this study, that relatively poor control procedures were used as corresponding or analogous teeth were not employed when making a comparison of the different materials tested. Therefore, despite the fact that all cavity preparations were technically standardized, some necessarily would be closer to the pulp than others. A possible variation in susceptibility of the pulps of the different teeth

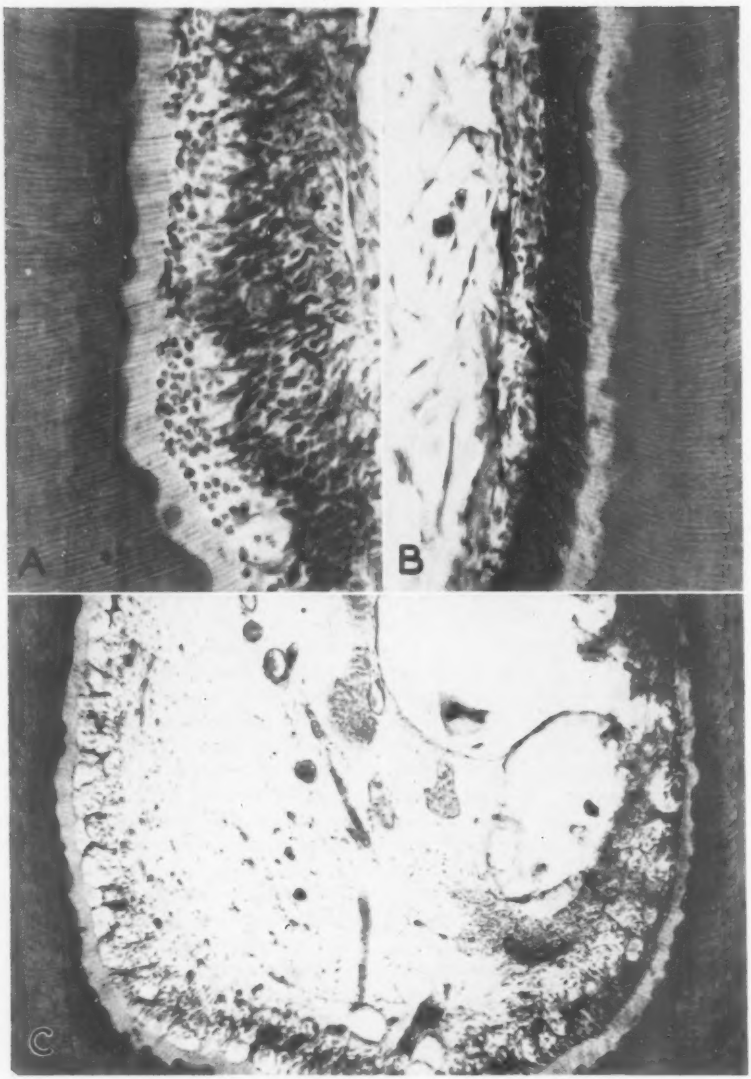

Fig. 2 • A: Upper right first molar showing pulp tissue underlying cut dentinal tubules of cavity filled with Acrylic B for one day. Significant changes are engorgement of blood vessels, inflammatory response and recession of odontoblasts. B: Normal appearing pulp as seen in lingual region underlying intact tooth structure. An Acrylic B filling had been placed on the labial side with resultant pulp changes as seen in A. C: Upper left first bicuspid filled with Acrylic B for four days. Pulp underlying cavity preparation is to the right. Vacuolization of odontoblasts is seen throughout the section, whereas, hyperemia and hemorrhage are manifest primarily on the cavity side

Fig. 3 • A: Upper left second bicuspid in which an Acrylic A restoration with cavity liner was in place for four days. There is hyperemia and vacuolization in the odontoblastic zone underlying cut dentinal tubules

B: Lower right cuspid filled with Acrylic A without cavity liner. Restoration was in place for four days. Except for some degree of hyperemia, the pulp is essentially normal

used also warrants consideration.

A panel discussion on pulpal irritation from various self-curing resins was held at the twenty-ninth annual meeting of the International Association for Dental Research. It was apparent that reported findings of different investigators were not entirely in agreement. However, in no instance was there an indication that the type of pathologic response was of an irreversible nature. The observations in the present study are generally in accord with this impression.

SUMMARY

A clinical and experimental study was undertaken to determine the usefulness of the auto-polymerizing resins for permanent restorations.

A total of 600 restorations were placed in human teeth and, wherever possible, the completed case followed by means of periodic re-examination. An additional 72 restorations were placed in the teeth of four dogs and sections prepared for histologic study in order to determine the pulpal response at periodic intervals following insertion of the fillings. Two acrylic materials of different polymerizing speed were selected for study.

Of 105 restorations in human teeth that were under observation for a one year period, five pulp deaths occurred. The histologic findings in the dog teeth suggest that the pulpal response, although of pathologic nature, is probably a reversible one.

All restorations demonstrated a slight tendency to yellowish discoloration. It was also observed that the material flows under stress and, therefore, is not indicated for use in stress-bearing areas.

Although the self-curing resins have the property of insolubility in oral fluids, the technic of insertion is more difficult and time consuming than for silicates.

Further clinical and histologic study is recommended before adopting this material for indiscriminate use.

Translating Research Into Action • A chronic problem for the scientist is the translation of research into action. Here the scientist is faced with a dilemma. If he himself devotes attention to application of his results, then he no longer has time for more research; if he does not apply his results, then the work may be neglected for years. The research man wants to continue his investigations and also wants to apply his results. The solution of this problem can be found by better understanding between the investigator and the administrator. . . .

One aspect of the general problem is the difficulty of obtaining means to conduct ecological research before a situation reaches an emergency state. This condition can be traced largely to a failure of ecologists and administrators to understand one another. Ecologists have lacked imagination in application of their results, and administrators have been submerged in daily routine. The result is that, when a situation becomes critical, the ecologist has no information and the administrator is so busy "doing something" that he couldn't utilize information if he could get it. *David E. Davis, "Symposium on the Application of Ecology to Water Conservation," The Scientific Monthly 73:343, December 1951.*

The effect of direct filling resins on the tooth pulp

Alexander Seelig, D.D.S., New York

The effect on the tooth pulp of direct filling resins is of utmost importance to the general practitioner. These materials have been used for a short time and little has appeared in the literature regarding their effect on the pulp.

Fred A. Slack[1] described the use of denture base acrylic resin as a direct filling material. No activator was used and the material was placed in the cavity preparation while it was in a gummy state. He reported some success. No injury to the pulp was noted by any clinical tests. The first histologic report on the effect of the direct filling resins on the pulp resulted from studies[2] at Montefiore Hospital in 1949. Experiments were carried out on teeth from young monkeys. It was shown that neither the method of mixing the acrylic resin nor the depth or extensiveness of the cavity preparation caused irritation in the pulp after 24 hours or after eight days. This study was conducted on one brand of plastic purchased on the open market at that time. In 1950, the same authors[3] published a report covering several brands of plastic also purchased on the open market. It was shown that some of the plastics caused reactions in the pulp. Further experiments showed that the products were changed without notice and that some which had acted in an adverse fashion when first tested now caused little or no pulpal damage. McLean,[4] in 1948, reported no clinical evidence of injury to pulps of teeth caused by direct filling resins which remained in the teeth for a period of six months.

Despite the work done in this field, a great deal of confusion still exists and pulpal irritation caused by direct filling resin is still a problem. In unpublished reports and in discussions at various meetings claims have been made of the devitalization of pulps caused by the placing of direct fillings of resin. It also has been shown that a sludge is present on the floor of the preparation when resinous fillings are removed.

MANIPULATION AND PLACEMENT OF DIRECT FILLING RESIN

The effect of the insertion of the material was tested in prepared cavities in animals' teeth, and it was found that the material itself produced no deleterious ef-

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Adjunct in research, dental department, Montefiore Hospital. Instructor in anatomy, School of Dental and Oral Surgery, Columbia University.

1. Slack, F. A., Jr. Present research status of direct acrylic restorations. J.A.D.A. 30:1233 (Aug.) 1943.

2. Lefkowitz, W.; Seelig, A., and Zachinsky, L. Pulp response to a self-curing acrylic filling material. New York D.J. 15:376 (Aug.-Sept.) 1949.

3. Seelig, A., and Lefkowitz, W. Pulp response to filling materials. New York D.J. 16:540 (Dec.) 1950.

4. McLean, J. W. Fixation of acrylic inlays by direct polymerization. Brit. D.J. 84:76 (Feb. 20) 1948.

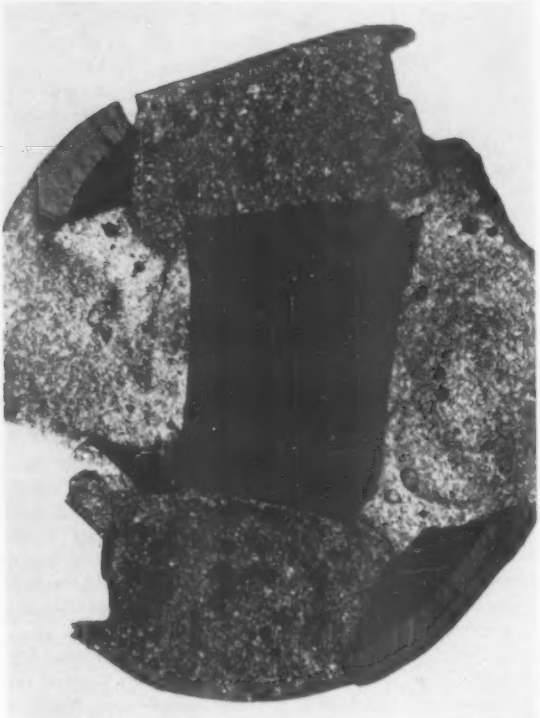

Fig. 1 • Photomicrograph of a cross-section of a tooth having four acrylic fillings. The buccal and lingual fillings were made with the pressure technic. The mesial and distal fillings were made with the Nealon technic. Magnification X 20

fect on the pulp. Therefore, a study was undertaken to determine whether injury to the pulp might be caused by factors other than the toxicity of the material. The problems involved in diagnosis and cavity preparation are the same with resins as with any other filling material and therefore do not need to be considered in this discussion. The manipulation of the material and the placing of it in the cavity are of utmost importance. If it is too hard when it is placed, it will not adapt itself to the preparation and a leaky margin will result. A common cause of pulpal irritation is the leaky margin that results when the matrix is disturbed or is removed too soon. At one time the manufacturers advised the holding of the matrix over the filling for three to eight minutes. If the pressure method is used the matrix should be held with a mechanical holder for a minimum of 15 minutes.

Frank Nealon has introduced a nonpressure brush technic which consists of picking up a bead of monomer and polymer and flowing it into the preparation. This method eliminates some of the difficulties which are encountered with the pressure technic. The filling is made in much less time, the matrix is not used in Class V cavities, and no pressure is necessary. An excess of liquid is used but this surplus monomer applied directly to the freshly cut dentin does not cause severe pulpal irritation.[2,3] The monomer is but slightly soluble in water and does not

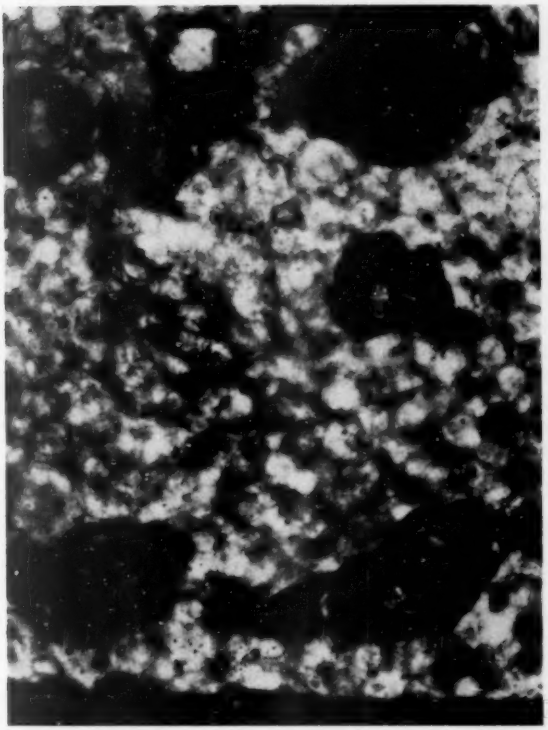

Fig. 2. — *Photomicrograph of the buccal filling shown in Figure 1. Magnification X 72*

penetrate the protoplasm in the tubules as does the acid of cements.

ADAPTATION OF THE RESINS TO MARGINS AND CAVITY WALLS

An experiment was set up to study the adaptation of the resinous filling materials to the margins and cavity walls. The Nealon technic and the so-called pressure method were used. Cavity preparations were made in recently extracted teeth on the buccal, lingual and proximal surfaces. The proximal cavities were filled using the Nealon technic and the others were filled using the pressure method. The teeth were then cut transversely through the fillings and ground sections were prepared (Fig. 1). The buccal and lingual fillings were made using the pressure technic and the proximal fillings were made using the Nealon method. The heavy black spots in the fillings as shown in Figure 1 probably are caused by the excess of monomer that is trapped in the filling which prevents the light from going through the specimen. When this monomer finally polymerizes and shrinks, holes are produced. The fillings made using the Nealon technic have less trapped monomer and therefore are less porous. They are also lighter because they contain less powder. The powder contains the pigment and since the Nealon technic utilizes less powder one gets a lighter filling.

Figure 2 shows the same buccal filling as shown in Figure 1. The porosity, probably due to the trapped monomer, can be seen. The adaptation of the filling to the walls of dentin is excellent. The distribution of the pigment can be seen. Figure 3 shows the same mesial filling as shown in Figure 1. This filling was made using the Nealon technic. There is little porosity because of the slight amount of trapped monomer. Less polymer is used in this method and therefore the filling is lighter because it contains a lesser amount of pigment. The adaptation to the cavity walls is excellent whether the Nealon or so-called pressure method is used. However, when the pressure method is used and the matrix is disturbed or moved while the material is in the gummy stage a slight space will be created between the filling material and the cavity wall. Regardless of the technic used, it was found that the acrylic filling adapted itself to the dentin in such an excellent fashion that ground sections could be made without disturbing the fillings. There was no adhesion of the fillings to the walls of the preparation. The adaptation of the acrylic resins to the walls of the preparation is as satisfactory as that of other filling materials.

CONCLUSIONS

1. Experiments on teeth from young monkeys have shown that some direct

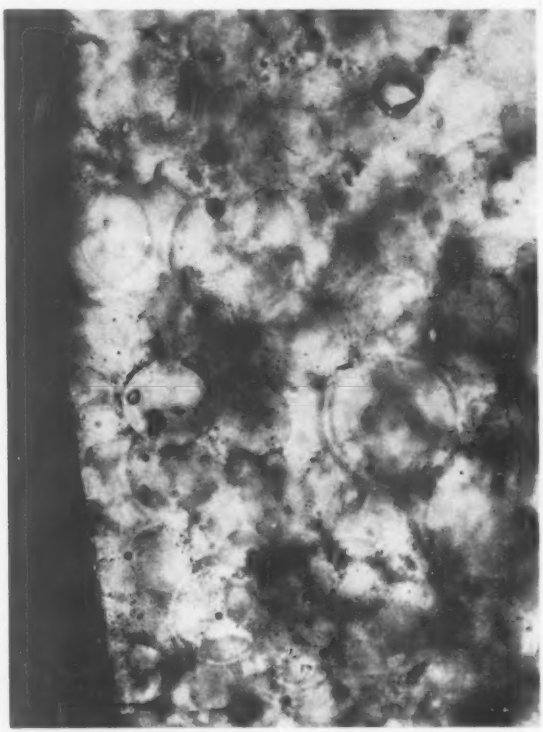

Fig. 3 • Photomicrograph of the mesial filling shown in Figure 1. Magnification X 250

filling resins do not cause pulpal irritation, no matter what method is used in mixing or how deep or extensive is the cavity preparation.

2. Some acrylic resins cause a slight reaction which may be reversible.

3. The excess of monomer does not cause pulpal irritation.

4. The early removal of the matrix when employing the pressure technic causes leakage with subsequent pulpal irritation.

5. The Nealon technic gives a less porous filling and eliminates some of the difficulties of the pressure method.

6. The adaptation of the direct filling resin to the cavity preparation when polymerized is excellent and precludes the possibility of leakage with subsequent injury to the pulp.

7. In case of pulp injury, the diagnosis, the cavity preparation and the technics of filling should be examined before the direct filling resins are condemned.

Plastic teeth: their advantages, disadvantages and limitations

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Plastic teeth, when first introduced to the dental profession, presented many desirable as well as undesirable physical properties in their clinical application. Some of the undesirable properties of the first plastic teeth undoubtedly were caused by the chemical composition and manufacturing processes utilized at that time. The chemical composition and manufacturing processes have been altered and improved and this has resulted in the production of plastic teeth with improved physical properties which are now better in clinical application.

The several nationally advertised plastic teeth on the market today exhibit physical properties, molds and shades of varied acceptability to the profession. One tooth exhibits desirable physical properties but the shades are not too satisfactory, while another tooth exhibits acceptable shades but it is exaggerated in contour. The dental profession must decide on the acceptability of these teeth as they use and evaluate them in clinical practice. Too often new dental products introduced to the dental profession are accepted solely on the manufacturer's claims, and, in a few instances, this practice has proved embarrassing and costly to the profession. It is not necessary to accept the manufacturer's claims alone on new dental products since the profession has available the excellent research facilities of the National Bureau of Standards which conducts clinical and laboratory tests on these materials.

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Colonel, DC, Walter Reed Army Medical Center, Washington, D.C.

ADVANTAGES OF PLASTIC TEETH

Esthetic Qualities • It is generally conceded that the esthetic qualities of plastic teeth are acceptable. The saturation, brilliance, tone, hue and translucency are superior, and these teeth, in most instances, blend satisfactorily with the natural teeth.

Altering Contours • Plastic teeth are readily altered in contour by grinding for purposes of lapping and staggering. This makes them versatile in their application when it is necessary to copy a crowded arrangement of natural teeth.

Imitation of Individual Characteristics • Plastic teeth are easily stained which makes it possible to duplicate the peculiar esthetic qualities of certain natural teeth. This staining is accomplished with a minimum of effort and specialized equipment.

Butting Against the Ridge • These teeth are easily reduced for butting against the edentulous ridges. The cut surface is susceptible to receiving a high polish which makes these teeth more compatible with the soft tissues than are porcelain teeth.

Adaptability to Unusual Conditions • Plastic teeth are ideal for replacing isolated teeth in partial dentures and they are a desirable replacement in a denture where the occlusogingival or incisogingival space is limited. Also, they are useful for providing protrusive balance in full dentures. Plastic teeth are useful in providing anatomic form to isolated replacements in partial denture castings during the wax up procedure and they are easily altered in contour for positioning next to surfaces of abutment teeth. Also, they are readily ground and altered in shape to form the labial surface of a plastic jacket crown.

Wear of Plastic Teeth • Boddicker,[1] Kelly[2] and Beall[3] have indicated that plastic teeth wear down more readily than do porcelain, metal or natural teeth. However, to date, adequate tests have not been devised to correlate the wear of plastic teeth in a milling machine with that which occurs in service in the mouth. From one viewpoint; the fact that plastic teeth wear down may be considered beneficial to the patient. Since balanced occlusion in full upper and lower dentures is desirable from a biologic and mechanical viewpoint, and, too, since this balanced occlusion cannot prevail after the dentures have settled, it may be that the wearing down could be considered beneficial because it provides a means of perpetuating balanced occlusion as the dentures settle into the tissues during function.

DISADVANTAGES OF PLASTIC TEETH

Crazing • Early investigations of the physical properties of acrylic resin and plastic teeth indicated that crazing was a major problem.[4,5,6] These investigations outlined the causes of crazing and directed attention to proper laboratory procedures which would eliminate crazing or keep it to a minimum. It was pointed out that the major contributing factor which induced crazing was the subjection of these materials to the solvent action of acrylic monomer, acetone or chloroform. However, the more recent plastic teeth available to the profession are supposedly more resistant to the solvent action of these chemical agents. Therefore, crazing

1. Boddicker, V. S. Abrasion tests for artificial teeth. J.A.D.A. 35:793 (Dec.) 1947.

2. Kelly, E. B. Has the advent of plastics in dentistry proved of great scientific value? J. Pros. Den. 1:168 (Jan.-March) 1951.

3. Beall, J. R. Wear of acrylic resin teeth. J.A.D.A. 30:252 (Feb.) 1943.

4. Pryor, W. J. Internal strains in denture base materials. J.A.D.A. 30:1382 (Sept. 1) 1943.

5. Peyton, F. A. Packing and processing denture base materials. J.A.D.A. 40:520 (May) 1950.

6. Tylman, S. D. Acrylics: their present status and technics as applied to crown and bridge prosthesis. J.A.D.A. 29:1845 (Oct.) 1942.

should not be as much of a problem as formerly.

Wear of Plastic Teeth • The wearing down of plastic teeth was mentioned earlier as a desirable property. However, the undesirable features must be considered also. It has been shown that plastic teeth wear down quite readily,[1,2,3] and clinical experience has confirmed this observation. Wearing down of plastic teeth may seriously affect vertical dimension, tooth relationship and masticating efficiency, thereby causing increased horizontal stresses. In the construction of full dentures it is well to use porcelain posterior teeth and plastic anterior teeth.

Bleaching • Plastic teeth, on occasion, bleach during the processing of the denture. The Bureau of Standards[7] points out that water coming into contact with the plastic teeth during the processing procedures contributes to this phenomenon. Tin-foiling the teeth would aid in preventing this failure of the material.[8,9]

Distortion • Careless flasking procedures will contribute to the distortion of plastic teeth during processing. Improperly mixed plaster, flowed next to plastic teeth, allows their external surfaces to flow into these imperfections in the plaster. This causes the formation of blebs and a general distortion of the surface of these teeth.

Rebasing and Duplicating • Rebasing and duplicating dentures on which plastic teeth were used presents a problem. The plastic teeth cannot be removed readily from the denture either singly or as a unit and replaced in the mold. Thus it is difficult to create a neat junction of the original plastic teeth and the new acrylic resin. Rebasing a denture on which plastic teeth were used may cause some bleaching or crazing of the teeth during fabrication.

Cross Matching of Shades • Cross matching of shades is a troublesome problem from the standpoint of the laboratory when the operator specifies a desired shade for a restoration in one of the porcelain shades and then specifies that plastic teeth be used. The better procedure is to give the shade and specify the manufacturer's plastic teeth desired. The end result will be more in keeping with the operator's expectations.

FABRICATION PRECAUTIONS

Cleanliness • The maximum in cleanliness must be observed during all fabrication procedures if the desired end result is to be obtained. All oils, greases, waxes and solvents must be kept from, or be removed from, plastic teeth during fabrication procedures.

Curing Cycle • A proper curing cycle must be adhered to meticulously if the maximum physical properties of the acrylic resin and plastic teeth are to be obtained. A suggested curing cycle which will meet these specifications is as follows:

1. The packed flask is allowed to set for one hour after test packing.
2. The flask is placed in room temperature water. The temperature is slowly brought to 158° F. and held at this temperature for one and a half to two hours.
3. The temperature is raised to 212° F. and the flask is boiled for a half hour.
4. It is bench cooled for a half hour and then cooled in running water for 20 minutes. The flask may now be opened.

Wax Elimination • Complete elimination of wax to insure proper union of the re-

7. Unpublished data from the National Bureau of Standards.

8. Skinner, E. W. Acrylic denture base materials: their physical properties and manipulation. J. Pros. Den. 1:161 (Jan.-March) 1951.

9. Ferguson, G. W.; Paffenbarger, G. C., and Schoonover, I. C. Deficiencies of tinfoil substitutes in the processing of acrylic resin. J.A.D.A. 38:573 (May) 1949.

pair material and plastic teeth to the denture base material is most essential. Tests recently conducted by the National Bureau of Standards[10] indicate that the failure of a repair or the detaching of plastic teeth from the repaired denture is due to incomplete wax elimination. An acceptable procedure to eliminate wax is as follows: (1) heat the flask in boiling water for three minutes and then open; (2) flush with boiling water; (3) flush with boiling water to which a detergent has been added, and (4) flush with clean boiling water.

Application of Flame to Plastic Teeth During Waxing • It is not good practice to soften the wax by applying flame during the wax up procedure as this may cause crazing of the plastic teeth. Many dental laboratory technicians carelessly apply flame to finish the wax up.

Solvents • All organic solvents, including monomer, must be kept from coming in contact with the acrylic resin or plastic teeth during all repair procedures. If solvents or monomer are allowed to come into contact with acrylic resin or plastic teeth, crazing may result. When using the self-curing repair resins, a coating of wax on the area next to the section to be repaired will prevent the repair material from coming in contact with the original denture base material.

Repairs • If heat-cured resin is used for repairing or rebasing an acrylic resin denture, a low temperature cure is desirable to prevent warpage of the original denture base material. An acceptable procedure to follow in processing these repairs is to cure them for nine hours at 158° F.

SUMMARY

Plastic teeth are not all that could be desired insofar as tooth form, color, density, wear resistance and efficiency are concerned but they do exhibit characteristics and physical properties which are a definite adjunct in creating more esthetic and efficient prosthetic replacements. The dentist and laboratory technician must exercise the same precautions in fabricating procedures as are exercised in the fabrication of acrylic resins in general. Obviously, to improve clinical and laboratory prosthetic procedures as practiced today, the aim must not be to see how quickly the work can be done but how well can each phase of the procedure be done. Also, not how quickly will the appliance be finished but how long will the appliance last and contribute to the health and general welfare of the patient.

10. Schoonover, I. C., and others. Bonding of plastic teeth to heat-cured denture base resins. See p. 285 of this issue.

Literary Liberties • If you steal from one author, it's plagiarism; if you steal from many, it's research. *Wilson Mizner.*

The effect of molding processes on some properties of denture resins

A. H. Grunewald, D.D.S., M.S.; George C. Paffenbarger,† D.D.S., and George Dickson,‡ M.A., Washington, D. C.*

Any technic for the construction of artificial dentures from synthetic resins must meet three requirements. The technic must produce dentures which (1) accurately conform to the supporting oral tissues, (2) are dimensionally stable and (3) have the best possible physical and chemical properties obtainable in the resin used.

A number of procedures, all of which are based on either compression or injection molding or some modification of these methods, have been proposed to meet these three requirements. Advocates of each method make certain claims for their procedures over those of other methods.

Much of the confusion which exists in this controversy rises from the fact that sufficient data are not available on the various methods of processing under controlled conditions, therefore, a comparison cannot be made. It was the purpose of this investigation to obtain data on some of the more commonly used methods of molding and to utilize these data in evaluating the merits and faults of these processes.

METHODS AND TECHNICS INVESTIGATED

The following methods or technics were investigated:

1. Injection molding using the flask and technic recommended by Pryor.[1,2] The injection flask was heated in a water bath covering only the lower half of the flask. A fan was directed against the injector while curing. The upper and lower spring housings were maintained within $\frac{3}{16}$ inch of contact for pressure control. The water bath was heated to boiling in one hour and boiled for 45 minutes. After curing, the flask was bench cooled for at least one hour and then cooled to room temperature in water before being opened.

2. Injection molding using a modification of the Pryor injection flask and technic. This technic, which has been recommended[3] to prevent curing of the resin in the cylinder of the Pryor injection

Submitted by A. H. Grunewald in partial fulfillment of the requirements of the Graduate School of Georgetown University for the Degree of Master of Science.

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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†Senior research associate, American Dental Association, National Bureau of Standards.

‡Physicist, Dental Research Section, National Bureau of Standards.

1. Pryor, W. J. Methods of producing more lifelike dentures, including the preparation and processing of acrylic resins. J.A.D.A. 28:894 (June) 1941.

2. Pryor, W. J. Injection molding of plastics for dentures. J.A.D.A. 29:1400 (Aug. 1) 1942.

3. Private communication from Capt. Frank Jeffries, DC, USN.

flask before the resin in the denture has cured, is the same as the first technic described, with the following exceptions. A portion of the top of the flask was cut out to reduce thermal conduction by the metal of the flask to the cylinder. The cylinder was held in place by the investing artificial stone. A plaster bowl with a hole cut in the bottom was slipped over the injection cylinder and sealed in place with artificial stone. Ice was placed in the plaster bowl to keep the injection cylinder cool during the curing process.

3. Injection molding using Luxene equipment and technic. Dentures were made in a commercial laboratory licensed by the manufacturer and in a dentist's laboratory using the Luxene equipment and the technic advocated by Luxene, Inc.

4. Compression molding. In this technic the molds were first overfilled and all flash removed after each trial closure until no excess resin remained in the mold. No additional material was added before final closure. The flask, in a rigid clamp, was placed in water at room temperature and uniformly heated to boiling in one hour. Boiling was continued for 45 minutes. The flask was bench cooled for at least one hour and then cooled to room temperature in water before being opened.

5. Compression molding using a soldering iron heating method.[4] In this technic heat was supplied by an 80 watt soldering iron with the tip inserted in the upper half of the flask. The flask was heated (by the soldering iron) for two and a half hours and then was cooled as in the fourth technic described.

The data reported were obtained on complete upper and lower dentures with a full complement of porcelain teeth, denture blanks without teeth, and flat specimens of resin, depending on the type of measurements being made.

Two brands of acrylic resin from the List of Certified Denture Resins (A.D.A. Specification No. 12) were used in all of the molding methods examined except in the technic and equipment advocated by the Luxene Co. A resin said to be a copolymer of methyl methacrylate and vinyl resin and sold for use with this equipment was used in this case. In each molding process examined, data were obtained to show: (1) how accurately the method reproduced the model (wax denture pattern or denture blank); (2) how and to what extent the molding technic affected the dimensional stability of the molded product, and (3) whether or not some of the physical or chemical properties of the resin were altered by the process employed.

ACCURACY OF REPRODUCTION

Accuracy of Horizontal Dimension • A decrease in dimension across the heel of the denture occurred on removal from the model after processing. This decrease in horizontal dimension was observed in both injection and compression molding. No data are available, however, with which to evaluate the magnitude of this decrease in dimension produced when various molding technics are employed, or to determine which one of many steps involved in waxing, preparation of mold, or insertion and curing of resin may be the primary factor causing this dimensional change.

In the first series of experiments data were obtained on the dimensional changes which occurred in each stage of the processing of a denture by both injection molding and compression molding technics and by modifications of these technics.

In addition to the actual dentures, denture blanks cured on a stainless steel die were prepared. The distances were measured between the reference marks on the stainless steel die (Fig. 1, left) and

4. Presented by Lamar Harris at a clinic given before American Denture Society, Chicago, Ill., Feb. 1948.

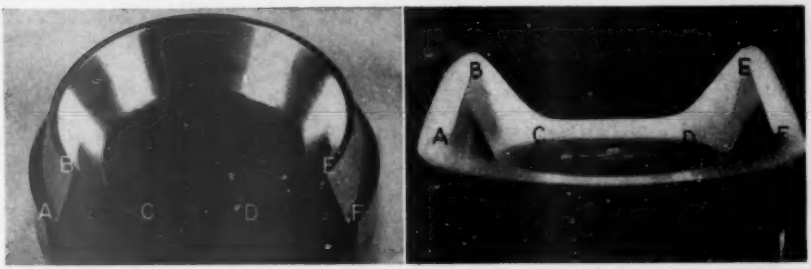

Fig. 1 • Left: Stainless steel die simulating the shape of the denture bearing surface of an edentulous jaw. Reference marks (not visible in this picture) were ruled at points A, B, C, D, E and F. The principal measurements were over the distance A-F. Right: Inverted denture blank form cured on steel die shown at left. Reference marks at A, B, C, D, E and F positions were transferred from the die to the form during curing. The difference between the distance A-F on the die and A-F on the denture form was used as a measure of the linear shrinkage which occurred during processing

on the reproduction of these marks transferred to the denture blanks (Fig. 1, right) during processing. In the actual dentures, measurements were taken between reference marks placed in gold foil fillings inserted in the porcelain teeth prior to constructing the wax setup. All measurements were taken at a constant temperature, 21°C. ± 1°C. (70°F. ± 2°F.) with a measuring microscope after adjusting the specimens on the stage of the microscope so that the points measured were in a horizontal plane.

In the case of the denture blanks, measurements were made on the resin blank only after cure and removal of the blank from the mold. However, on most of the actual dentures, measurements were made on the wax pattern prior to investing and after investing to the occlusal surfaces of the teeth. Measurements also were made on the denture after curing and removal of the stone index, on the denture after separation from the flask but while still on the model, and on the denture after removal from the model and polishing (Fig. 2).

The data from these experiments are given in the table and Figure 2. These data show that although a definite decrease in dimension occurred across the heel of both the dentures and the denture blanks, no significant difference in the amount of change was noted between the specimens molded by the injection and the compression methods.

No significant change in dimension occurred as a result of investing the wax pattern. The greatest change occurred on removal of the denture from the model. Figure 2 indicates that only minor changes occurred over the dimensions C-D, C-A and D-B, and that the greatest change occurred over the dimension A-B.

In all these experiments no evidence was obtained to indicate that dentures made by compression technics were less accurate than those processed by injection methods. These data are not in agreement with the claims made by Pryor[1, 2] and others[5] that the wax pattern is reproduced more accurately by injection methods.

Accuracy of Vertical Dimension • It has been reported[5] that the change in vertical

5. Schuyler, C. E.; Friedrich, E. G., and Vaughan, H. C. Processing acrylic dentures: compression and injection method. U. S. Nav. M. Bull. 43:277 (Aug.) 1944.

Table • Data on methods of molding dentures

Technic	Specimen	Total change in dimension from second molar to second molar* after: Flasking to occlusal surface	Curing	Deflasking	Removing from model and polishing	Immersion in water for 3 weeks at 21°C. (70°F.)	Increase in weight during 3 week immersion	Incisal pin drop
		%	%	%	%	%	%	mm.
Injection, Pryor	Upper denture	0.0	−0.5	−0.4	−0.9	−0.8	0.3	
	Lower denture	−0.1	−0.7	−0.6	−1.4	−1.4	0.3	1.4
	Upper denture	−0.1	−0.4	−0.3	−0.9	−0.9	0.5	
	Lower denture	−0.1	−0.4	−0.4	−1.0	−1.1	0.4	0.3
	Average	−0.1	−0.5	−0.4	−1.0	−1.1	0.4	0.9†
Injection, ‡ Pryor (modified)	Upper denture	−0.1		−0.3	−0.9			
	Lower denture	−0.1		−0.3	−0.9			4.7
	Average	−0.1		−0.3	−0.9			
Injection, Luxene	Upper denture			0.0	−0.5	−0.5	0.2	
	Lower denture			−0.2	−0.5	−0.5	0.2	0.3
	Upper denture			−0.1	−0.4			
	Lower denture			−0.2	−1.0			0.6
	Average			−0.1	−0.6	−0.5§	0.2§	0.4
Compression	Upper denture	−0.1	−0.3	−0.3	−0.8	−0.8	0.3	
	Lower denture	+0.2	+0.1	−0.3	−0.8	−0.8	0.3	0.9
	Upper denture	−0.2	−0.2	−0.3	−0.7	−0.6	0.5	
	Lower denture	0.0	+0.1	0.0	−0.6	−0.5	0.3	0.0
	Average	−0.1	−0.1	−0.2	−0.7	−0.7	0.4	0.3**
Compression, soldering iron	Upper denture	−0.1	−0.1	−0.1	−0.4			
	Lower denture	0.0	−0.1	0.0	−0.7			0.3
	Upper denture	−0.1	−0.1	−0.1	−0.6			
	Lower denture	0.0	0.0	−0.1	−0.5			0.0
	Average	0.0	−0.1	−0.1	−0.6			0.2
Injection, Pryor	Denture blank 1				−0.4	−0.2***	1.0	
	Denture blank 2				−0.4	−0.2	1.0	
	Average				−0.4	−0.2	1.0	
Compression	Denture blank 1‖				−0.2	−0.1***	1.1	
	Denture blank 2				−0.3	−0.1	1.0	
	Average				−0.2	−0.1	1.0	

*On the denture blanks measurements were made from A to F (Fig. 1).
†Includes one additional case (1.1 mm.).
‡Processed at U. S. Naval Dental School, National Naval Medical Center, Bethesda, Md.
§Includes one upper and one lower denture only.
**Includes three additional cases (0.1 mm., 0.2 mm., 0.2 mm.).
***Twenty-five days immersion.

dimension (opening of bite) of a denture cured by injection methods is always less than that observed when compression molding is done.

Data on the relative amount of opening were obtained on the dentures used for determination of accuracy of horizontal dimension and on several additional dentures. In each instance the casts were scored and mounted on a Hanau articulator with the condyles in a locked position and the top of the incisal pin flush with the top surface of the upper jaw member of the articulator. After completion of the wax setup (Fig. 3 and 4, left), the casts were removed from the articulator, the bottom surfaces tin-foiled and the wax models invested in plaster of Paris to the occlusal surfaces of the teeth. The remainder of the flask was then poured in artificial stone and the denture cured. The dentures were removed from the flasks after processing and the sprues were removed from the injection molded dentures. The dentures on the artificial stone casts were then returned to the

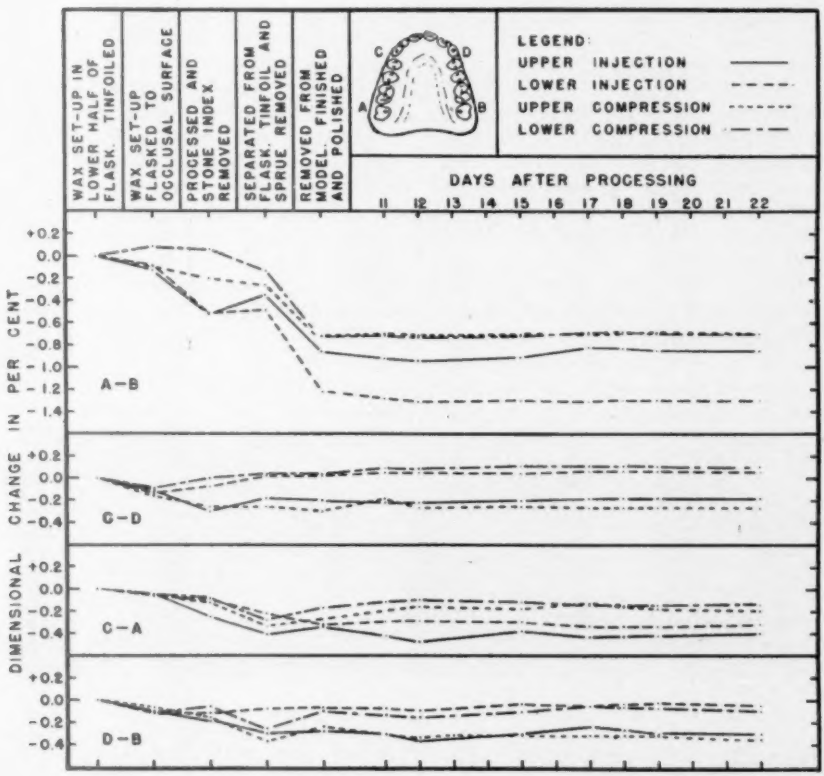

Fig. 2 • Change in dimension of dentures during processing and after storage in water at 21° C. ± 1 C. (70 F. ± 2 F.)

Fig. 3 • Left: Wax models of upper and lower dentures mounted on articulator showing lateral view of the occlusion prior to processing the dentures in clear acrylic resin by compression molding. Compare the occlusion with that of the processed dentures at the right. Right: Lateral view of the occlusion of upper and lower dentures processed in clear acrylic resin by compression molding. The dentures have been remounted on the articulator in the same relative position as the wax models. A comparison with the dentures at the left shows the excellent reproduction of the occlusal relationship

articulator (Fig. 3, right and 4, right). The casts were seated carefully and reluted on the articulator. After it was determined that no particular tooth or teeth had moved excessively and caused the existing vertical opening, the amount of incisal pin drop was measured with a dial gage. It is recognized that such measurements do not indicate the actual vertical opening, but since all dentures were measured by the same method, the results give a comparison of the amount of vertical opening which had occurred.

The average amounts of incisal pin drop are given in the table. It can be seen that except where the modified Pryor technic[3] was used there was no significant difference in the results. It is believed that the unusually large amount of pin drop, 4.7 mm., in the denture processed by the modified Pryor technic was caused by the use of too much pressure

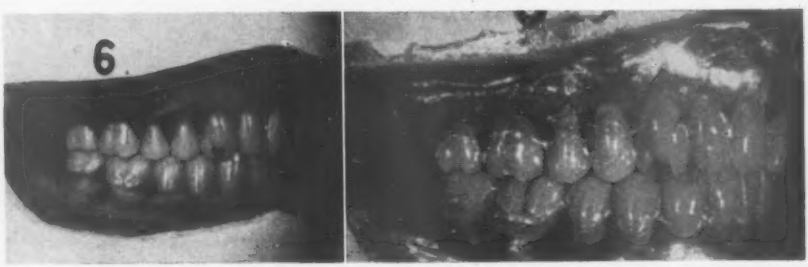

Fig. 4 • Left: Wax model of upper and lower dentures mounted on an articulator prior to processing the dentures in clear acrylic resin by injection molding. Compare the occlusion with that of the processed dentures shown at the right. Right: Lateral view of the occlusion of the upper and lower dentures processed in clear acrylic resin by injection molding. The dentures have been remounted on the articulator in the same relative position as the wax models. A comparison with the dentures at the left shows the excellent reproduction of the occlusal relationship

on the resin. A thick flash was present around both the upper and lower dentures indicating that the halves of the flasks had been separated and the dentures thickened.

The data in the table are contrary to the claims made[1,8] that a greater increase in vertical dimension resulting in an open bite occurs with compression molded dentures. These data also do not confirm the experiences of some practicing dentists who report difficulty with compression molding because of the opening of the bite. To determine why instances of open bite sometimes do occur in compression molding, an investigation of the factors which might produce an increase in vertical dimension was undertaken. The most likely factors appeared to be the following: (1) excess acrylic resin in the mold at the time of final closure; (2) too rapid closure of the flask to permit a normal flow of the acrylic resin dough; (3) processing in a green all plaster of Paris mold; (4) use of a thin mix of plaster of Paris in investing the model, and (5) failure to use a spring clamp during curing which might permit expansion of the acrylic resin without distortion of the mold. Several dentures were processed in which all, except the first, of the foregoing possible causes of opening were present. In no instance was there a significant increase in the amount of opening. However, when a denture was trial packed and additional resin was added before final closure, an incisal pin drop of 1.5 mm. (0.6 mm. more than that produced by any of the other compression technics) was recorded. It is believed that the addition of excess resin before final closure may be the cause of many of the instances of opening which occurred with the compression technic.

Most of the directions supplied by manufacturers require that excess resin be present in the compression mold at the time of final closure. To accomplish this, some manufacturers recommend that the flask be overpacked and that the two halves of the flask be brought to within 2 mm. of each other on the last trial closure. The flask is then opened, the trimming of the flash completed and the final closure of the flask made. Others recommend that an excess of acrylic resin be added to the mold, in one way or another, before final closure. Apparently it has been assumed that the recommended excess is essential to provide sufficient pressure in the compression mold to assure a satisfactory cure of the acrylic resin without formation of bubbles. It is questionable, however, whether it is possible to maintain more pressure in an overfilled mold than in a completely filled one regardless of how much force is applied.

If an excess of acrylic resin is added to a compression mold and sufficient force applied, most of the excess resin will flow out of the mold. However, regardless of the amount of force that can be applied with the flask press, a small amount of flash will remain. The larger the amount of flash, the greater the increase in the vertical opening in the completed denture.

Flow of Resin in Injection Molding • Since there was no discernible difference in horizontal or vertical dimensions between the dentures processed by the injection methods and those processed by the compression methods, it appeared that there might not be any actual injection of the resin into the mold during the curing process by the injection technics. To determine whether or not resin was injected during curing, brass pins were inserted through the sides of a Pryor injection flask (Fig. 5) into a central sprue. Thermocouples were placed just below the injection cylinder and also between the inner ends of the pins. The mold was boiled out and filled with resin. A steel wool pad was placed between the resin and the end of the piston to prevent resin from backing up along the side of the piston and partially or completely freezing it. The pins were removed at various

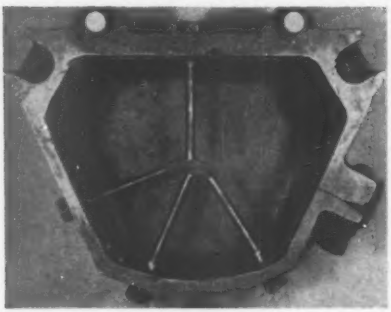

Fig. 5 • Bottom and middle section of a Pryor injection flask to which four brass pin inserts have been added. These pins connected the mold with the external surface of the flask. When a pin was withdrawn from the flask a tunnel was formed connecting the mold with the external surface of the flask. If resin were fed into the mold during curing, extrusion of the resin into the tunnel would occur

temperatures before and after rapid polymerization began, as indicated by the temperature of the resin.

Before rapid polymerization began, the resin flowed readily from the central sprue when the pins were removed. After rapid polymerization had started there was no flow when the pins were removed (Fig. 6). The temperature immediately below the piston was consistently lower than at the pins, indicating that polymerization did not take place in the cylinder first and prevent the piston from functioning. This experiment was repeated several times, but in no instance was the resin injected after rapid polymerization began. It is at this point (different for various brands of resin) that the major portion of the curing shrinkage occurs. A considerable amount of the shrinkage would be compensated for if any appreciable amount of resin were injected into the mold at this time. Both the above experiment and the data on the dimensions of the dentures indicate that this method of injection molding of dentures does not compensate for curing shrinkage.

The fact that using the Luxene equipment and technic also did not compensate for shrinkage caused by curing was demonstrated by curing flat specimens approximately 2 by 2.5 by $\frac{3}{16}$ inch. The sprue was placed in the center of the specimen. A noticeable depression was present on the upper surface between the sprue and border of the specimen after processing (Fig. 7).

DIMENSIONAL STABILITY

The most likely causes for dimensional instability of dentures molded by various technics are: (1) strain produced in the denture during processing and later released in service, with accompanying change in dimensions; (2) changes in dimension resulting from gain or loss of water caused by the method of proces-

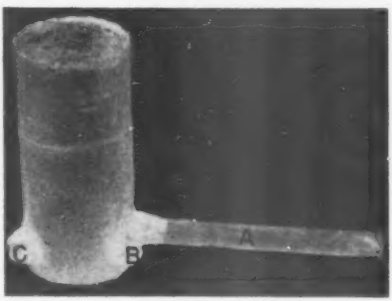

Fig. 6 • Specimen of clear acrylic resin processed in Pryor injection flask shown in Figure 5. A shows extrusion of resin into tunnel when brass pin was removed at 74° C. (165° F.) prior to the point where rapid polymerization of the resin began, as determined by the accelerated rise in temperature. Other pins fastened at B and C were removed at 86° C. (187° F.) and 96° C. (205° F.) respectively. No extrusion of the resin occurred. The protuberances at B and C were part of the mold formed when the warmed pin was inserted into the wax cylinder used to form the mold. B and C are cored by the impression of the brass pins thus showing no appreciable feeding of resin into the canal at either 86° C. or 96° C. The maximum temperature attained in the resin was 103° C. (217° F.)

sing, and (3) incomplete polymerization or curing of the dentures, followed by further polymerization or loss of monomer in service and resultant shrinkage[6].

Only the first two factors were investigated, since the curing process employed assured complete polymerization by both the compression and injection methods.

Strain would be expected to occur in dentures because the denture material, which has a coefficient of thermal expansion (or contraction) of approximately 80×10^{-6} per degree centigrade, is cured in a plaster mold with a coefficient of approximately 12×10^{-6} per degree centigrade. Thus, during the cooling period after curing, the denture material is restricted from contracting normally in all directions by the shape of the mold. It has been claimed, however, that the amount of strain is less in injection molded methyl methacrylate resin than in the same resin compression molded without benefit of spring pressure.[7] The following experiments were made to determine the amount of dimensional change caused by strain release.

Four acrylic resin denture blanks (Fig. 1, right) processed on metal dies by injection and compression methods were used. The distances between the cross marks on each denture blank were determined. The blanks were then placed in water at 37°C. (99°F.), 50°C. (122°F.), 60°C. (140°F.), 70°C. (158°F.) and 80°C. (176°F.) for 16 hours at each temperature. Measurements were again made between the cross marks after each heat treatment. The dimensions of the denture blanks after any of the foregoing heat treatments did not differ from the dimensions of the blanks before heating to 37°C. (99°F.) by more than the experimental error of 0.02 mm.

These results show that if there was any release of internal strain at 80°C. (176°F.) in these acrylic resin denture blanks processed by either the injection or compression methods, it was not sufficient to cause distortion. However, while

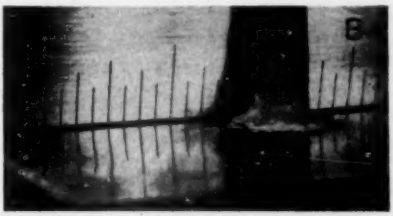

Fig. 7 • Flat block of Luxene 44 made by the Luxene technic and equipment. A is injection sprue. Note the space between the steel scale B and the block C which shows the amount of shrinkage that occurred during processing

the dentures molded by the Pryor injection method, the Luxene injection method or the normal compression method (one upper and lower denture of each) and cured on dental stone instead of on a metal die, showed no dimensional change on heating at 60°C. (140°F.); nevertheless, they all became distorted on heating at 80°C. (176°F.) for 16 hours. This distortion amounted to an average apparent contraction in the A-B dimension of 0.45 mm. in the upper and lower dentures molded by the Pryor injection method and 0.08 mm. in the dentures molded by the Luxene method and 0.22 mm. for those molded by the compression method. As 60°C. (140°F.) is about the highest temperature that can be tolerated comfortably in the oral cavity, it follows that there should be little or no distortion due to thermal strain release in dentures in service regardless of whether they are made by the compression or the injection method.

It has been demonstrated[8] that any increase or decrease in water content of resin dentures is accompanied by a cor-

6. Caul, H. J., and Schoonover, I. C. Method of determining the extent of polymerization of acrylic resins and its application for dentures. J.A.D.A. 39:1 (July) 1949.

7. Pryor, W. J. Internal strains in denture base materials. J.A.D.A. 30:1382 (Sept. 1) 1943.

8. Sweeney, W. T.; Paffenbarger, G. C., and Beall, J. R. Acrylic resins for dentures. J.A.D.A. 29:7 (Jan.) 1942.

responding increase or decrease in dimension of the denture. Therefore, in the investigation of dimensional stability of dentures processed by injection and compression methods, determinations of the water sorption of denture blanks and dentures processed by the various methods were made.

In determining the effect of the method of molding on water sorption, the denture blanks used for determination of accuracy of reproduction and strain release also were weighed at intervals during an initial storage in water at 21°C. (70°F.) for 21 to 25 days after they were cured. In addition, weighings were made after each of the heat treatments (22 to 34 days after curing) referred to earlier and at intervals up to a total period of approximately eight months. All denture blanks were stored in water at 21°C. (70°F.), except when placed in a controlled temperature bath at the temperature and time specified. All weighings were made at 21°C. (70°F.) as follows: the denture blanks were removed from the water, wiped with a towel for one minute, placed palate side up for 30 seconds, turned tooth side up for 30 seconds and the weight determined.

There was no important difference in the amount of water sorption by the denture blanks molded either by the Pryor injection method or the normal compression method (Fig. 8). The rate of water sorption in all denture blanks was increased

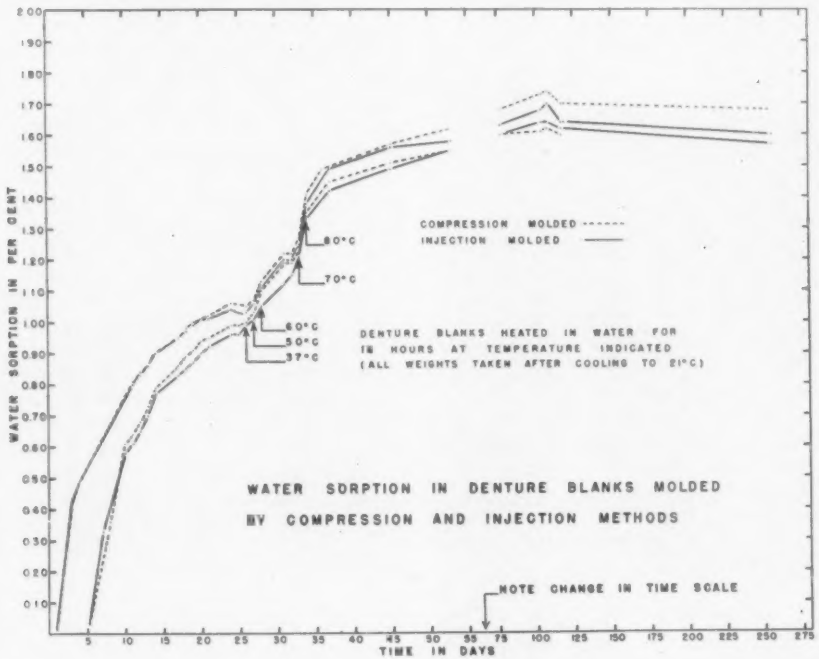
WATER SORPTION IN PER CENT
TIME IN DAYS
COMPRESSION MOLDED
INJECTION MOLDED
80°C
70°C
60°C
50°C
37°C
DENTURE BLANKS HEATED IN WATER FOR 16 HOURS AT TEMPERATURE INDICATED (ALL WEIGHTS TAKEN AFTER COOLING TO 21°C)
WATER SORPTION IN DENTURE BLANKS MOLDED BY COMPRESSION AND INJECTION METHODS
NOTE CHANGE IN TIME SCALE

Fig. 8 • Water sorption in denture blanks which were kept in water at 21° C. (70° F.) except when heated in water for 16 hours at each of the indicated temperatures

considerably when they were placed in water at the elevated temperatures specified. The increased rate of sorption of water by the blanks when stored at 21°C. (70°F.) after being heat treated (Fig. 8) is being investigated.

The dimensional changes accompanying the water sorption during the first three weeks after curing are given in the table for the denture blanks and in the table and Figure 2 for the actual dentures. The expansion of the denture blanks during the three weeks' storage in water at 21°C. (70°F.) reduced the average 0.40 per cent contraction which had taken place during the processing of the injection molded blanks to 0.18 per cent contraction with an increase in weight of 1.0 per cent, while the average 0.26 per cent contraction of the compression molded blanks was reduced to 0.12 per cent contraction with the same increase in weight. From the table and Figure 2 it can be seen that little (0.1 per cent or less) or no expansion occurred when the actual dentures were stored in water for three weeks. This small change in the dimension of the dentures corresponds to a small change in weight, not more than 0.5 per cent of the weight of the resin, which indicates that the dentures probably were almost saturated with water at room temperature after being polished. This may account in part for the apparent differences between these data and those reported elsewhere.[9]

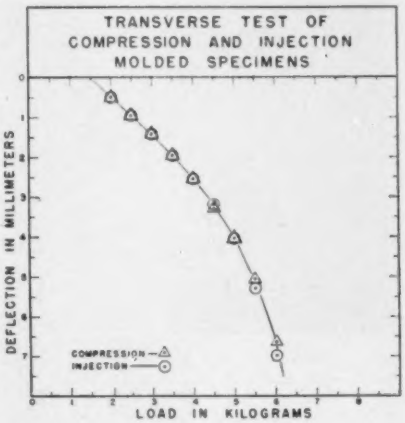

Fig. 10 • Transverse deflection of compression molded and injection molded specimens of denture resin

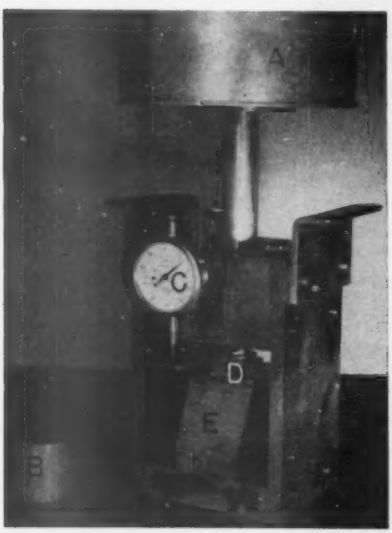

Fig. 9 • Instrument for determining transverse properties of denture base materials: B, 500 Gm. of lead shot which when deposited in bucket A caused a deflection of specimen D supported by anvil E. Deflection of specimen is read directly on dial gage C

HARDNESS AND TRANSVERSE TESTS

Data were obtained on hardness and transverse deflection of resins processed by injection and compression methods in order to determine whether the method of molding affected these properties.

9. Do vinyl-acrylic dentures fit better? Vernonite Work Bench, 6, (Aug.) 1947.

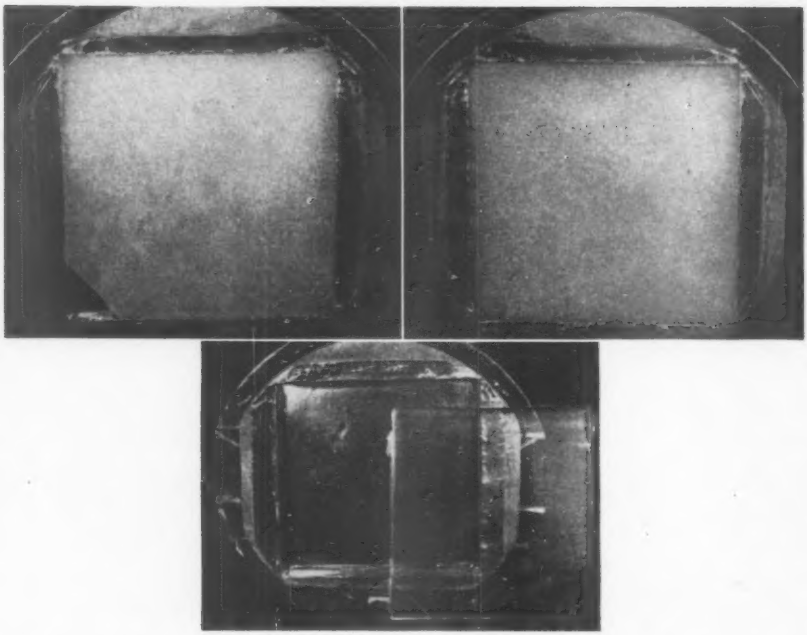

Fig. 11 • Above left: Plaster of Paris mold lined with tin foil and with corner section of resin dough removed after mold had been completely filled and trial packed. Above right: Same mold as at left after reclosing, pressing and reopening flask without the addition of more dough. Note that the mold is apparently filled. Below: Specimen of clear acrylic resin and mold in which it was processed. Notice line on lower left hand corner of specimen which is a reproduction of the groove made in original tin-foil lining when the section of resin dough was cut from the corner of the mold (see above, left)

Hardness • The comparative hardness of acrylic resin processed by injection and compression methods was determined on specimens cut from a cake of resin approximately 62 by 65 by 5 mm. processed in a tin-foil-lined artificial stone mold by the injection method and from a similar cake processed by the compression method. Ten Knoop indenter marks, made on each specimen at 21°C. (70°F.), were averaged in determining the Knoop number.

The Knoop number of the injection molded specimens was 13.8 and of the compression molded specimens 13.6. As a difference in Knoop numbers of less than 0.5 is not considered to indicate any real difference in hardness in this range, it appears that there is no difference in the hardness of acrylic resin processed by these methods.

Transverse Test • A cake of resin approximately 62 by 65 by 5 mm. was processed in a tin-foil-lined artificial stone mold by the compression method and another cake by the injection method. Specimens 2.5 mm. thick by 10 mm. wide by 65 mm. long were machined from the resin cake and finished to a tolerance of

±0.03 mm. in width and thickness. These specimens were stored in water at 37°C. (99°F.) for three days immediately prior to testing in air at 37°C. (99°F.). The specimens were mounted in the deflection measuring instrument shown in Figure 9. An initial load of 1,500 Gm. was placed on the specimen and additional loads applied at the rate of 500 Gm. per minute. The deflection was measured 30 seconds after each load increment. Tests were made on four specimens molded by the normal compression technic and four molded by the Pryor injection technic.

The average deflection of the four injection molded and the four compression molded specimens (Fig. 10) was so similar that the test results fall on practically the same curve. Hence, no advantage is shown for either method as far as transverse deflection is concerned.

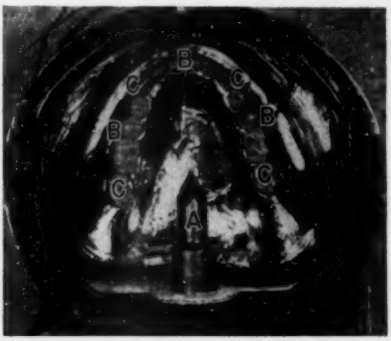

Fig. 12 • Compression flask with soldering iron insert: A, soldering iron; B, thermocouples for measuring temperatures; C, gold foil restorations in porcelain teeth. These restorations have cross reference marks engraved on them

OTHER EFFECTS OF MOLDING TECHNICS

Soundness • Bubbles were not detected by the unaided eye in any of the dentures processed by the injection technics or by the normal compression technic. It has been common practice to place additional resin in compression molds after the final trial pack in order to prevent formation of bubbles. The fact that no bubbles were observed in the dentures and specimens processed by the normal compression technic indicates that this addition of excess resin is not necessary. This fact was further demonstrated by an experiment in which a portion of the resin was removed from a rectangular tin-foiled mold (Fig. 11, above left) which had been carefully trial packed. When the flask was replaced in the press for a few minutes, the resin dough flowed into the cavity and appeared to again entirely fill the mold (Fig. 11, above right). No bubbles were present when the specimen was then cured without the addition of any material (Fig. 11, below). Although this experiment should not be interpreted as indicating that it is unnecessary to fill the mold carefully when using compression technics, it does indicate that there is no necessity for the addition of resin after the final trial pack.

Bubbles occurred in three of the four dentures processed by the soldering iron compression molding technic. In one denture these bubbles may have been caused partially by a slight leak of the resin from the mold where the soldering iron was inserted (Fig. 12). There was no leakage, however, in the two lower dentures which had bubbles. The bubbles in these dentures, which occurred in the buccal and labial areas only, may have been caused by the resin curing and shrinking first in the lingual area of the dentures near the soldering iron, thus reducing the pressure on the buccal and labial sections. Thermocouples placed in these dentures indicated that the resin in the lingual areas cured first. In the lingual areas the maximum temperature of about 110°C. (230°F.) was obtained at the end of one hour, while in the buccal and labial areas the maximum temperature of only 65°C. to 71°C. (149°F. to 160°F.) was obtained at the end of two hours.

Checked Teeth • Since no teeth checked in any of the dentures processed by the compression or injection technics, no disadvantage was indicated for any of the technics in this respect.

SUMMARY AND CONCLUSIONS

1. The dimensional accuracy and stability of finished dentures made by compression and injection methods of molding were not significantly different.

2. The hardness, transverse deflection and water sorption of the resins employed in making the dentures were practically the same regardless of the method of molding.

3. Bubbles occurred only in some of the dentures made by a compression technic in which a soldering iron was the source of heat.

4. Checked teeth were not produced in any of the compression molded or injection molded dentures.

5. The compression and the injection methods of molding produce equally satisfactory dentures.

DISCUSSION BY WALTER J. PRYOR

I do not agree with some of the conclusions expressed by the authors of this article. My comments regarding these conclusions and certain statements in the article follow:

Conclusions One and Two • I agree if only dentures of ordinary thickness are concerned. However, unusually thick dentures will exhibit gross porosity if the heat schedule recommended by the authors is followed. If such cases are exposed in finishing the dentures, sorption and strength will be affected.

Conclusion Three • Bubbles will occur in all thick specimens and will show clearly in all clear acrylic specimens cured by the technic recommended by the authors.

Conclusion Four • It is practically impossible to check teeth with the present day plastic material. In the early forties checking was so prevalent that the manufacturers' chemists were forced to improve the formula of the material by softening it. The technic used by the authors was impossible 10 years ago as it would have caused wholesale breakage of the teeth. To minimize tooth breakage, manufacturers recommended spacing the porcelain teeth and packing with an excess of material. The authors err in stating that overpacking was recommended to prevent porosity. The injection method prevented almost 100 per cent of tooth checking. The more firmly packed mold,[1] especially if diatoric teeth were used, reduced the strain about the neck of the teeth.

Conclusion Five • I agree if only dentures of ordinary thickness are concerned. However curing thick dentures by the compression method requires lower heat (160° F.) and longer time (six to nine hours) to avoid porosity. At the end of that period the temperature should be raised to boiling point to assure complete polymerization.

The authors, by using thermocouples and metal pins, attempt to prove that no more plastic material is carried into the mold by the injection method than by the compression method. The following simple procedure will disclose their error: Wrap two equal weight wax cylinders three quarter inches long by three quarter inches in diameter in tin foil so that the edges of the foil protrude to engage the investing stone. Invest them side by side in a Pryor flask. Attach a sprue to one for the injection technic. Separate the flask and remove wax with hot water or steam. Pack both molds from the same mix of clear resin. Use as many trial closures as seem desirable. Place a sheet of cellophane between the two halves of the flask. Before packing place a thin strip of metal over the sprue hole and along the side of the mold for easy removal before packing the sprue hole. Add enough plastic dough to compensate for the space formerly occupied by the metal strip. Pack the sprue hole with pink plastic. Cure one hour to boiling point and

1. Taylor, P. B. Acrylic resins: their manipulation. J.A.D.A. 28:373 (March) 1941.

boil 45 minutes. The sample cured by the injection method will weigh about eight grains more than the other, demonstrating the authors' error.

No technic will prevent shrinkage that occurs in the late stages of polymerization or that caused by cooling to room temperature. The plastic mass first undergoes strong expansion which in some bulky cases is sufficient to crack the investment. When the temperature reaches about 180° F. expansion subsides and contraction sets in. It is at this temperature that final packing or injection takes place. Cases packed at room temperature will be underpacked when the water bath passes 180° F. In early experiments with the injection method it was found that unvulcanized rubber, used as an insulator between the metal piston and the plastic, was injected through the center of the sprues into the denture, although the outside of the sprues were thoroughly cured. This demonstrates that the center of the plastic mass was slower in polymerizing[2] and explains the authors' error in reasoning when using the metal pins inserted from the outside of the flask.

With respect to the experiment in which a portion of resin was removed from a rectangular tin-foiled mold (Fig. 11), I believe that a millimeter gage or even a careful eye examination of the finished product would show that the piece was undersize and the surface irregular.

Overpacking with any technic will cause some increase in vertical dimension. If the injection method is used properly this condition will not occur. The advantages of the injection technic using the plastic material now available are: (1) only one trial closing of the flask is necessary, (2) slow curing at low temperature is unnecessary, (3) the internal packing helps maintain occlusion of dentures that are being relined, (4) compensates for bulk shrinkage as final packing is done at 180° F. (water bath) after the initial expansion has taken place.

Linear shrinkage cannot be controlled by any method of curing. However, such shrinkage is kept within practical bounds by the shape of the mold.

2. Pryor, W. J. Injection molding of plastics for dentures. J.A.D.A. 28:1400 (Aug. 1) 1942.

AUTHORS' COMMENT

Conclusions One, Two, Three and Five • Dr. Pryor presents no data showing that the dimensional accuracy and stability of dentures made by either method are significantly different. The authors processed heavy dentures using the heat cycle given in the report and found bubbles in both the compression molded and injection molded dentures but not of sufficient size or number to show readily on cross-sectioning.

Other investigators have reported porous dentures when processed by the injection method.[1]

Conclusion Four • No one was able to prove that any of the various theories attempting to explain checked teeth had any validity because no one was able to produce or to prevent the checking of teeth at will.

Data on the deflection in the transverse test on several brands of acrylic resins from 1938 or 1941 to 1946 give no evidence of the softening of the resins by the manufacturers.

To the best of the authors' knowledge the technic of trial closure without the final addition of excess material was not in general use in the early forties. Reference to the mixing directions used by many manufacturers at that time will confirm this.

There are ample examples in the literature[2] and in direction sheets of manufacturers to show that many felt an excess of resin in the mold was necessary to prevent the formation of bubbles in the resin.

The two cylinders described by Dr. Pryor to show injection into the mold are substantially the same as those processed by the authors. It would appear that the pink resin had flowed into the clear to compensate for the curing shrinkage. However, much of the pink material was injected into the mold prior to heating. This was proved if the cross-sectioning of the cylinders was done on the unpolymerized resins. The experiment does conclusively show that more resin can be forced into a given mold by the injection method than by the compression method. This advantage appears of no practical consequence in the processing of dentures as demonstrated in the report.

The injection system shows to most advantage in filling the mold when the ratio be-

1. Some observations on injection molded dentures. Vernonite Work Bench. Vol. 5 (June) 1946.

2. Tylman, S. D., and Peyton, F. A. Acrylics and other dental resins. Philadelphia, J. B. Lippincott Co., 1946, p. 119.

tween the surface and volume of the mold is low. In a sphere the advantage is greatest; in a disk the least. This accounts for the difficulty in demonstrating that better dentures are made by injection than by compression.

In Figures 5 and 6 it was demonstrated that if rapid polymerization had occurred there was no additional injection of the resin in that particular area of polymerization. However, there is apparently some injection during polymerization as witnessed by the opening of the jaws of the injector mechanism. To show this the volumes of four different sizes of cylinders, processed by the injection method, were plotted against the feed-in of the injector plunger. From these data it was seen that over half of the theoretical shrinkage occurring during polymerization may be compensated for on the cylinders. The statement in the report that the experiments shown in Figures 5 and 6 indicate "that this method of injection molding of dentures does not compensate for curing shrinkage" could well be changed to" . . . does not compensate to any significant extent for the curing shrinkage." However, it must be reiterated that no practical difference was demonstrated on fit or dimensional accuracy of dentures processed by either method.

Dr. Pryor's experiment using the soft unvulcanized rubber was repeated on cylinders. Cross-sections made prior to polymerizing showed the rubber to have flowed down the center of the sprue just as a liquid will flow easier and faster in the center of a pipe than along its wall.

The irregularities of the surface of the blank (Fig. 11) to which Dr. Pryor refers were not present nor could the naked eye see that it was slightly undersize (approximately 0.25 mm.).

Responsibility of the Scientist • To the degree to which a scientist shows concern for the presuppositions of his subject and for its interrelations with other areas of experience, he exhibits that broader understanding which transforms science as specialized knowledge into science as an important enterprise of the human spirit. *A. Cornelius Benjamin, "Science and its Presuppositions," The Scientific Monthly 73:150, September, 1951.*

Bonding of plastic teeth to heat-cured denture base resins

I. C. Schoonover, Ph.D.; T. E. Fischer,† D.D.S.; A. F. Serio,‡ D.D.S., and W. T. Sweeney,§ A.B., Washington, D. C.*

One of the primary advantages of plastic teeth is their ability to bond chemically to the denture base resin, thereby providing better retention than can be obtained by the mechanical bonding of porcelain teeth. Occasionally, however, failures have been observed in which plastic teeth break loose from the denture, indicating that chemical bonding does not always occur. An examination of some of these teeth under a microscope revealed the absence of a chemical bond as evidenced by the smooth glossy surfaces of the teeth and walls of the socket, although the detail of the surfaces of the teeth reproduced in the socket showed that the teeth had been in intimate contact with the denture base resin.

The most probable explanation for this type of failure was the presence of a foreign material which adhered to the tooth surfaces and prevented bonding. Such a material could be (1) wax absorbed into the surfaces of the teeth during waxing, or (2) a trace of wax remaining as a residue on the surfaces of the teeth after the boiling-out procedure. In order to investigate the possibility that the presence of such a foreign material might be the primary cause for the failure of plastic teeth to bond to the denture base resin, experiments were conducted on the bonding characteristics of teeth which had never been in contact with wax and teeth which had been waxed up, with the wax removed by the standard technics used in the preparation of a denture. Samples of all the brands of plastic teeth currently on the market (Table 1) were used in this investigation.

EXPERIMENTAL PROCEDURE

The following experimental technic was developed for preparing the specimens and determining the strength of the union between the teeth and the denture base resin.

Cylindrical Hydrocal molds approximately 3 inches long and 0.3 inch in diameter were prepared in a denture flask. The surfaces of the molds were coated with a separating medium to facilitate the removal of the specimens. The tooth was placed in the center of the mold with the occlusal and ridge lap

Presented before the twenty-ninth general meeting of the International Association for Dental Research (Materials Group), French Lick, Ind., March 18, 1951.

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Table 1 • Plastic teeth used in investigation

Brand name	Manufacturer
Denta Pearl	H. D. Justi & Son, Inc.
Micromold	Austenal Laboratories, Inc.
Luxene	Luxene, Inc.
Verichrome 5-Phase	Universal Dental Co.
Dura Blend	Myerson Tooth Corp.
Trubyte	Dentists' Supply Co. of N.Y.
Dentron	Dentists' Supply Co. of N.Y.

surfaces normal to the long axis of the mold.

In the experiments in which no wax was employed the resin dough was packed into the mold around the tooth and the flask was trial packed at least three times. After the final closure the flask was placed in a flask press. The resin was polymerized by placing the flask in a water bath maintained at a temperature of 74° ± 1° C. (165° ± 1.8° F.) for one hour, after which it was placed in boiling water for half an hour. The flask was then removed from the water and permitted to cool in air to room temperature before being opened.

Table 2 • Strength of bond between plastic teeth and denture base resin

Treatment		Number of specimens	Tensile strength (lb. per sq. in.)
Teeth	Solution used for eliminating wax		
No wax	None	15	5,200 ± 800*
Waxed up	Boiling water only	34†	2,100 ± 600
Waxed up	Kerosene-ether (1:1)	29	5,700 ± 800
Waxed up	Synthetic detergent (hot, 1.5 per cent)	47	5,300 ± 800
No wax	Tin-foil substitutes (alginate type)	5‡	1,500 ± 600

*This is approximately the strength of the denture base resins used in this test.
†Six of these 34 specimens were so weak that the bond broke during their preparation, and they are not included in these calculations.
‡Two of these specimens behaved as above (†).
Note: In some specimens treated with detergent or kerosene-ether the bond was stronger than the tooth.

In the experiments in which wax was employed a rod of wax was attached to each end of the tooth, using a technic similar to that employed in preparing a wax setup. The conventional methods of eliminating wax (flushing with boiling water, 1:1 kerosene-ether mixture, trisodium phosphate, sal soda, and diluted acetic acid) were used to remove the wax from the mold and tooth. Both the mold and tooth surfaces were carefully examined for any visible trace of wax. If none was observed, resin was processed to the tooth by the method previously described.

Each specimen was machined in a lathe to a diameter of 0.25 ± 0.01 inch. This was done to obtain a butt joint between the resin and the tooth and thus eliminate any mechanical retention of the resin along the mesial, distal, buccal or lingual surfaces of the tooth. The specimen was then placed in tension until it broke, and the load required to break it was used as an index of the strength of the bond between the tooth and the resin.

RESULTS

The data in Table 2 show that the bond with teeth which had never been in contact with wax was as strong as the denture base resin. The rupture occurred at various points along the specimens and in some cases through the tooth itself, but never at the interface of the tooth and resin. However, in the experiments on teeth which had been in contact with wax and cleaned with boiling water alone, the bond was always weaker than the denture base resin. In some cases the bonding was so poor that the rods broke at the contacting tooth and resin surfaces during the machining operation, and in all cases rupture occurred at the junction of the tooth and resin when the specimens were placed in tension. These experiments indicate that, although no wax or oil could be detected by visual inspection after the mold was treated with a wax eliminant, a trace of wax did remain

which was sufficient to alter radically the bonding characteristics.

The presence of trace amounts of wax was later verified by using a fluorescent wax. The teeth, after being waxed with this material and treated by the various methods of wax elimination, were viewed under ultraviolet light. Any wax remaining on the teeth was readily detected by its fluorescence. This method was used to test the effectiveness of all the wax eliminants commonly employed. Of the solutions tested the kerosene-ether mixture was the only eliminant which completely removed all traces of wax. The data obtained (see Table 2) on the tensile strength of specimens on which kerosene-ether mixture was used to eliminate wax also verify this observation. Because of its disagreeable odor, its high cost, and its danger as a fire hazard, this mixture was not considered entirely suitable for dental use and an attempt was made to find some other effective method of removing wax.

It was found that a hot 1.5 per cent water solution of a modern synthetic household detergent (approximately 1 tablespoonful to 1 pint of water) would completely remove all wax and insure a good chemical union between the tooth and denture base resin (Table 2). The following procedure for removing wax was found to be completely effective with all brands of teeth tested.

1. Soften the wax sufficiently to permit removal of the bulk of it in one piece.
2. Pour the hot detergent solution over the mold and tooth surfaces. Three washings are sufficient to remove all traces of the wax.
3. Wash the mold with hot tap water to remove the detergent solution.

If a separating medium other than tin foil is used after the wax is completely removed from the mold and teeth, care must be taken to prevent it from coming in contact with the surfaces of the teeth, for these materials also will prevent chemical bonding. This was demonstrated in a series of experiments in which tin-foil substitutes were painted on teeth which had never been in contact with wax. Two common types were used, those containing a resin in a solvent and those containing alginate as the film-forming material. The manufacturers' directions for applying the foil substitute and removing any excess of the material were carefully followed in each case. Specimens were prepared from these teeth and their bonding strength was determined according to the technics previously described. The data in Table 2 show that tin-foil substitutes effectively prevented chemical bonding.

CONCLUSIONS

The primary cause for the failure of plastic teeth to bond chemically to the denture base resin is the presence of imperceptible traces of wax not removed by conventional methods of wax elimination. A simple rapid method for preventing such failures has been developed using modern synthetic detergents which effectively remove all traces of wax.

Traces of tin-foil substitutes also prevent chemical bonding, and if these materials are used, care should be exercised to prevent their coming in contact with the teeth.

Fluid exchange at the margins of dental restorations

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One of the most essential physical properties of a dental filling material is that it shall retain its size and form once it is placed and contoured to the tooth. This property, along with others, has limited the so-called permanent filling materials to a few; namely, amalgam, gold foil, cast gold, fused porcelain and, under certain circumstances, silicate cement. The successful clinical use of these materials would seem to indicate that any dimensional changes which might occur after the restoration had been properly finished were insignificant and of little or no consequence. Further, it has been believed that meticulous adaptations of a filling material to the cavity walls would assure the sealing of the prepared cavity.

Only in the use of amalgam has an attempt been made to compensate for differences in thermal expansion between the tooth and the restorative material. The setting expansion of amalgam has been established at 3 to 13 microns per centimeter to compensate for the differential shrinkage of tooth and filling over the range of temperatures which occur in the mouth. The importance of this setting expansion of amalgam has been discussed by Souder and Paffenbarger.[1]

The recent advent of the direct filling resin with the concomitant queries regarding its suitability for dental use naturally led to laboratory and clinical investigations to establish its appropriateness as a permanent filling material.[2-5] One of the physical properties of the acrylic resin filling materials which was considered to be of serious consequence was their high coefficient of thermal expansion. Heat-cured acrylic denture resins have a coefficient of linear thermal expansion of 81 ppm per degree centigrade. It can be assumed that the self-curing

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resins have a coefficient of thermal expansion of the same order of magnitude. This would make their linear dimensional change approximately seven times that of tooth structure whose coefficient of linear thermal expansion is 11 ppm per degree centigrade.[1] The influence of this difference in thermal expansion and the mechanism of its manifestations in the clinical use of the material are brought out in the following investigation.

MARGINAL PERCOLATION

To determine whether thermal changes in a self-curing acrylic resin restoration would cause a perceptible dimensional change in the restoration, an extracted upper central incisor was filled with one of the direct filling resins. The tooth was then immersed in ice water for 30 seconds, removed, wiped dry with a towel and viewed under a binocular microscope as the tooth warmed in the fingers. Invariably, small droplets of fluid exuded from the margins of the restoration as the tooth warmed (Fig. 1). Variations in the technic of mixing and placing and in the design of the cavities made in additional extracted teeth did not eliminate or seem to modify this extrusion of fluid at the margins.

An effort was made to determine the mechanism of this fluid exudation by placing the acrylic resin in simulated cavities blown in glass. It was thought that variations in the internal architecture of the cavity would affect the ability of the resin restoration to seal the cavity. The clear glass "cavities" permitted inspection of those shrinkage areas of the restoration which occurred at the interface of resin and glass.

These simulated cavities were filled with resin by the conventional technics; also, by increments of small size placed with a brush; by filling to a considerable excess and trimming; by filling to excess and removing some of the resin below the margin and placing the second increment; by filling and removing the set bulk of material and then cementing this to place as an inlay using additional acrylic resin as the cementing medium. None of these methods significantly altered the amount of fluid extruded at the margins when the specimen was allowed to warm after being cooled in the water.

Fig. 1 • Marginal percolation of a resin filling: A, resin; B, droplet; C, tooth; D, margin

Amalgam (Fig. 2), gold inlay (Fig. 3), silicate cement (Fig. 4), and, in addition, gold foil, gutta-percha and zinc oxide eugenol cement restorations in extracted teeth also leaked when they were subjected to cooling and warming.

During the study of one restoration in an extracted tooth, small bubbles of gas were seen to break from the margins immediately after the extruded fluid appeared at the margin. Extracted teeth, each containing a filling of self-curing resin, were placed in water and subjected to a vacuum, in the belief that one of the causes of the fluid loss at the margin

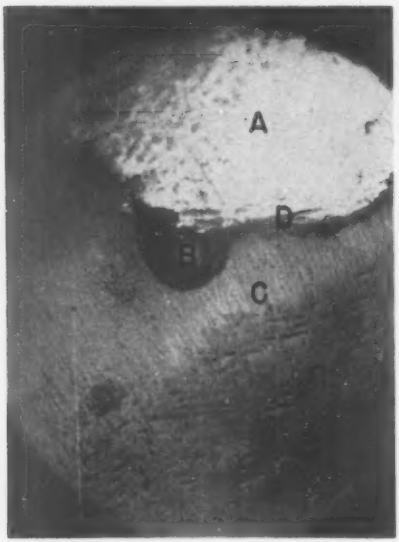

Fig. 2 • Marginal percolation of an amalgam filling: A, amalgam; B, droplet, C, tooth; D, margin. Dark shadow along margin is the result of oblique lighting

was gas trapped at the interface of the resin filling and tooth. Subjection to this reduced pressure for 30 minutes did not lessen the amount of fluid extruded at the margins.

To eliminate the possibility of a faulty procedure or a biased technic by the authors, leaders in the field of operative dentistry were asked to prepare cavities and to place gold inlay, gold foil, amalgam and acrylic restorations in sound extracted teeth supplied to them. Each cooperator was asked to place the restorations using, to the extent possible, his particular clinical procedure of cavity preparation and filling placement. At no time were the teeth allowed to dry out.

On their return to the National Bureau of Standards, the teeth were cooled in ice water for 30 seconds, wiped dry with a towel and allowed to warm in the fingers while being examined under a binocular microscope. All specimens of each material extruded fluid at the margins. During these experiments no specific pattern of leakage occurred, although each restoration always evidenced a fluid loss at the same point or points on its margin.

To determine the depth to which this fluid penetrated beneath the margin of acrylic restorations, three Class V cavities were prepared in extracted teeth. A few small crystals of fluorescein, (a fluorescent, water-soluble dye) were placed on the pulpal wall and the cavities were filled carefully with acrylic resin. These teeth were placed in room temperature water for several hours, then subjected to 10 cycles of cooling in ice water and warming to body temperature. As the specimens were warmed for the last time they were quickly wiped dry with a towel and observed under ultraviolet light. The fluid which was extruded at the margins

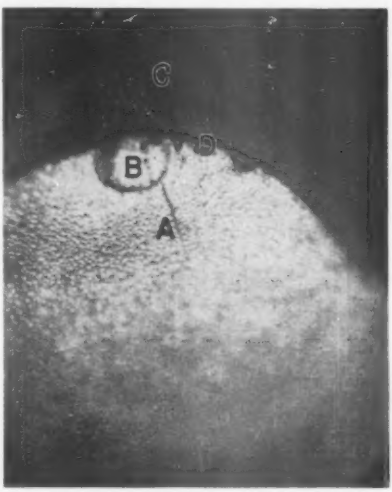

Fig. 3 • Marginal percolation of a gold inlay: A, gold inlay; B, droplet; C, tooth; D, margin. Small spheres seen on the gold are condensation of moisture

clearly showed the characteristic yellow-green fluorescent glow of the dye. This indicated that the fluid had reached the pulpal wall.

When the thermal test was applied to extracted teeth in which amalgam fillings had been in place for some time prior to extraction, no evidence of marginal seepage was observed. The possible reason for this will be discussed subsequently.

CLINICAL ASPECTS OF MARGINAL PERCOLATION

To establish the effect of cold and hot fluids on the temperature of anterior restorations in the mouth the following procedures were carried out.

Extremely hot coffee was served to five test subjects and the temperatures of the drinks were taken as soon as four ounces of fluid could be consumed comfortably in a few seconds. The average temperature, 60°C., was taken as the upper limit of thermal tolerance for this investigation.

Soft drinks, from a bottle dispensing machine, were found to have a temperature of 4°C. Since ice cooled beverages such as tea and coffee also reach a temperature of 4°C., this was taken as the lower limit of beverage temperature for this investigation.

Class III cavities, not involving the contact point, then were prepared for each of three patients. A 36 gage copper-constantan thermocouple was placed at the pulpal wall and a self-curing resin restoration was inserted. This filling held the thermocouple in position. A Brown recording pyrometer was used to indicate the temperature change beneath the restoration as each patient imbibed measured amounts of hot or cold beverages. The temperature of the restoration rapidly approximated the temperature of the beverage. The lowest temperature recorded was 9°C., caused by drinking iced water at 4°C. from a glass. The highest recorded temperature of the filling was 52°C. caused by drinking coffee at 60°C. Thus a temperature change of 43°C. is possible. This temperature variation is of consequence because, as explained before, an acrylic restoration expands or contracts with thermal change approximately seven times as much as the tooth structure. Therefore, when a tooth which has been restored with acrylic resin is chilled, a space will develop between the tooth and the resin. This space develops in addition to that caused by the shrinkage of the resin due to polymerization.

Fig. 4 • Marginal percolation of a silicate cement filling: A, silicate cement; B, droplet; C, tooth; D, margin

Assuming that a 7 per cent volumetric shrinkage occurs uniformly throughout the material during curing, and discounting the fact that some of the shrinkage occurs on the exposed surface of the filling, a 20 mm.[3] resin filling develops a space between itself and the tooth of 1.4 mm.[3] as a result of its curing shrinkage alone.[5] Should the restoration be chilled to 9°C., this space would be increased

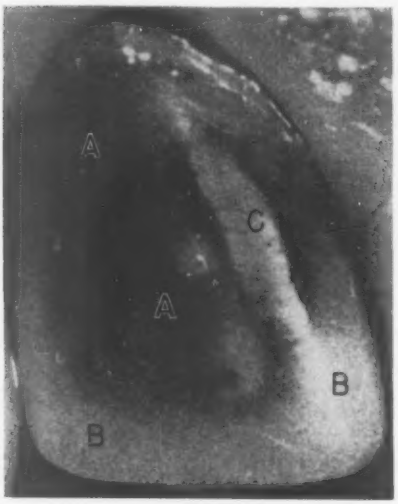

Fig. 5 • An experimental full jacket crown of self-curing acrylic resin which discolored: A, Dark gray stain spread rapidly over the area of the tooth preparation and was distributed into the resin to the depth of one half to 1 mm. within five months; B, portion of crown that has not been discolored; C, highlight on surface of crown

0.12 mm.³ because of thermal shrinkage of the resin, making the total space about the filling 1.5 mm.³ When the tooth is wet, fluids occupy this space.

Should this hypothetical 20 mm.³ restoration be warmed to the upper limit of the thermal tolerance of the mouth (52°C.) this space would become smaller due again to the wide difference in thermal expansion between the resin filling and the tooth. The volume of this space at 52°C. would be smaller than that at 9°C. by 0.18 mm.³ This change in volume would cause fluids to flow into and out of the space around a resin filling when it is subjected to the temperature changes encountered in the mouth.

Furthermore, the fluid itself expands and contracts with variations in temperature. The volume of fluid increases 0.016 mm.³ because of its own thermal expansion as the temperature is increased from 9°C. to 52°C. This makes a total fluid exchange through the margins of a 20 mm.³ acrylic filling 0.196 mm.³ or approximately 1 per cent of the total volume of the filling. Approximately 10 per cent of the volume of fluid extruded is caused by the thermal expansion of the fluid itself and about 90 per cent is caused by the differential thermal expansion of the resin and tooth structure.

The observations of the influence of temperature changes on restorations in the mouth were made with a binocular microscope mounted on the dental chair which allowed a careful inspection of the cavosurface margins. One of the first observations indicated that the optical properties of the resin filling made it difficult to discern small marginal discrepancies because the light transmitted through the filling was reflected from the cavity walls and also passed through the fluid film which was present at the interface of the filling and tooth. These factors often camouflaged the margin so that the restoration appeared to fit well. This factor does not appear in the observation of metal fillings because of the opaqueness of the metal restoration.

Vital teeth which contained restorations of various materials were subjected to the same tests as previously performed on extracted teeth.

The first test was performed on an experimental full jacket crown of self-curing acrylic resin. This crown (Fig. 5) began to discolor near the gingival margin approximately two months after placement. The discoloration progressed incisally until the entire area about the stump was darkened five months after placement. Prior to removal the crown was chilled, wiped dry and the margin observed under the microscope as the tooth returned to mouth temperature. Fluid seeped from beneath the crown at the labial margin as the tooth warmed. No movement of this fluid or of the

crown was noted when force was exerted on the restoration. The crown seemed well adapted to the tooth. After sectioning the crown to remove it, there was a noticeable foul odor and the discoloration was found to be distributed throughout the entire inner surface and it had penetrated the resin one-half to one mm. This progressive discoloration and the odor may have been caused by (1) the degradation of the organic components of the seepage, (2) some of the constituents of the resin, (3) the cavity liner used, or a combination of all three.

Class III and Class V cavities filled with direct filling resins were difficult to evaluate because it was impossible to bring the entire cavosurface margin into view or focus; also, the filling and tooth could not be dried thoroughly and rapidly enough, even under the rubber dam. However, in the labial restorations which were placed in the middle third of the crown a definite seepage could be seen as the tooth warmed after being chilled. No direct evidence of marginal seepage was observed in the amalgam, gold inlay, gold foil, and silicate cement restorations which had been in the mouth for some time and which were examined under the binocular microscope after they were chilled.

In view of the dimensional changes previously discussed, it would not be unreasonable to assume that a channel 10 microns in diameter could develop at the junction of the resin filling and the tooth. Since the limit of visual acuity is approximately 50 microns, defects 10 microns in diameter certainly would not be apparent to the unaided eye. Ten microns is a relatively large space when compared to the diameter of a red blood cell or an enamel rod. Relative to the size of a lactobacillus (diameter 2 microns) a defect 10 microns in diameter is already a large cavity (Fig. 6). If the acids and the enzymes commonly attributed to the production of dental caries are a component of the oral fluid which is exchanged during these thermal changes then the 10-micron defect would allow a virtual cataract of these molecules of acids and enzymes to be washed into and out of this space. When these fluids do enter the submarginal spaces, the cario-

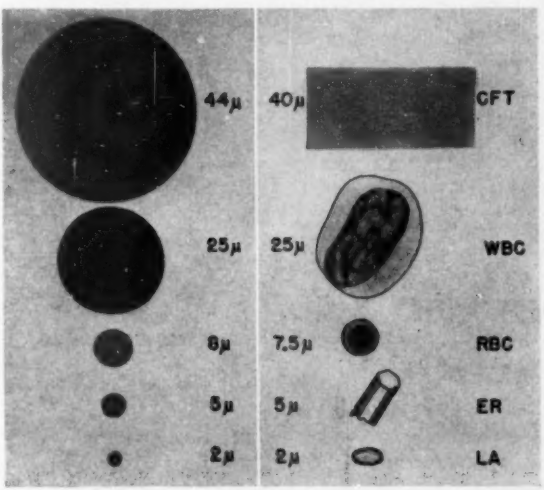

Fig. 6 • Circles on left are drawn to scale and the objects to the right represent a maximum for cement film thickness (CFT); a white blood corpuscle (WBC); a red blood corpuscle (RBC); enamel rod (ER); and a lactobacillus (LA). The fracture or dissolution of one enamel rod could possibly provide adequate passage for organisms and molecules to a protected area below the tooth surface

genic mechanisms they contain are allowed to function undisturbed. When the ability of the fluid to proteolyze or decalcify has been lost, the "spent" fluid could be forced from the recess and a new "charge" of cariogenic fluid could be drawn into the system simply by thermal changes in the tooth and filling.

In addition to the exchange of fluids resulting from thermal changes, there are other chemical and physical forces which might augment or act independently in causing this seepage. Some of these other forces may be capillarity, dialysis, diffusion and changes in hydraulic or gas pressures.[6]

It might seem that caries would always develop under these conditions. The bacteriostatic properties possessed by certain materials such as amalgam and silicate cement were discussed by Fraser in 1925.[7] The efficiency of silicate cement in this regard prevents the recurrence of caries around this restoration. This may be due to the fluoride content of the silicate cement.[8] The compounds formed under the plaques which develop on uncleansed margins may corrode amalgam restorations, and these corrosion products then probably act as both a mechanical and a bacteriostatic plug. Clinically, this process of choking the margins of amalgam restorations is seen as a dark discoloration. Once the channels have been filled with these corrosion products, the mechanism of fluid exchange is disrupted and a possible carious process probably impeded. This is substantiated by the failure of restorations to seep fluid if they have been in the mouth for any length of time.

As mentioned previously, metal and silicate restorations which had been in the mouth for some time failed to show evidence of seepage when tested both in the mouth or after extraction. This observation substantiates the conclusion that the small spaces between restoration and tooth ultimately become choked with debris or corrosion products of the filling material.

The coefficient of thermal expansion of materials like gold, 14 ppm,[1] and silicate, 7.5 ppm,[1] are close to that of tooth structure, 11 ppm.[1] Therefore, most of the percolation about gold and silicate cement restorations must be caused by the thermal expansion of the fluid in the minute defects between the tooth and the restoration.

The great variance in the coefficient of thermal expansion between the resin of the filling and the tooth structure and the attendant fluid exchange that occurs at the margins because of temperature changes may be a logical explanation of the occasional postoperative hypersensitivity or pulpal disturbances encountered in the use of this material. The direct filling resin has three inherent properties which affect its value as a permanent filling material. These are (1) their shrinkage of 6 to 8 per cent by volume during polymerization, (2) their thermal expansion which is probably more than seven times that of tooth structure and (3) their extreme inertness in mouth fluids. Because of this they possess no apparent bacteriostatic property which would discourage the recurrence of decay, as apparently do some of the other restorative materials. Careful observation of the direct restorations of acrylic resins over a period of several years is needed before a final conclusion on the suitability of these resins as a permanent restorative material can be made.

CONCLUSIONS

1. Temperature changes of teeth and restorations in the mouth cause a fluid exchange between the teeth and restora-

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tions made of gutta-percha, zinc oxide and eugenol cement, silicate cement, zinc phosphate cement, amalgam, cast gold, gold foil and acrylic resin.

2. This marginal percolation is caused in part by a difference in the coefficients of thermal expansion of the tooth and the restoration and by thermal expansion of the fluid occupying the crevice between the tooth and the restoration.

3. In light of the present concepts of the mechanisms of dental caries, marginal percolation may be an explanation for the recurrence of caries at the margins of some restorations.

4. Further observation of the influence of marginal percolation as a factor in the efficiency of the direct filling resin as a permanent filling material is required.

Properties of self-curing denture base resins

Harold J. Caul, B.S.; John W. Stanford,† and Andrew F. Serio,‡ D.D.S., Washington, D. C.*

If it can be demonstrated that the new self-curing resins are satisfactory for use as a denture base material, they will offer several advantages over the heat-cured type. They do not require elaborate heating equipment for processing, are less strained, do not exhibit the blushing and crazing observed in resins cured at elevated temperatures and require a substantially shorter period of time for processing.

About the only yardstick available for measurement of the properties of these resins is the "American Dental Association Specification No. 12 for Denture Base Material." There are at present 26 brands of heat-cured resin which have complied with this specification and are on the "List of Certified Dental Materials." Since these materials have proved to be satisfactory, it is reasonable that these new resins should be evaluated according to the standards of this specification.

Accordingly, most of the data presented in this paper were obtained using the tests described in the specification. The six different brands of self-curing resin which were investigated are listed in Table 1.

PLASTICITY

The plasticity of these resins and the rate at which it decreases as a result of their rapid rate of polymerization at room temperature are important in that they govern the working time available for

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Table 1 • Self-curing resins investigated

Brand	Manufacturer
Acralite 88	Acralite Co., Inc., New York
Bio-Therm	B. L. Dental Co., Inc., Richmond Hill, N. Y.
Cold-Cure	Perfected Dental Products Co., Chicago
Cur-O-Matic	Acri-Lux Dental Mfg. Co., Inc., New York
Duz-All	Coralite Dental Products Co., Chicago
so-Dent	Precision Dental Mfg. Co., Chicago

packing and trial packing the mold. It has been demonstrated in practical tests that at least five minutes is required to pack and trial pack a mold adequately.

In testing the available working time of these resins five minutes was permitted to elapse after the dough could be separated cleanly from the walls of the mixing jar. The plasticity determined at the end of this time showed that four of the six brands were usable. One of the materials was too stiff to be packed and the other was a borderline case. In all cases the working time was shorter than that available for packing the heat-cured resins, and packing and trial packing had to be done as rapidly as possible and without interruption. Also, a new mix of resin had to be made for each case packed.

TRANSVERSE STRENGTH

Values of the transverse strength of these resins are given in Table 2. The specification values for deflection at loads of 4,000 and 6,000 Gm. are included in the table for purposes of comparison. The results show that the self-cured resins do not meet the requirements of the specification. The average value for deflection of 3.3 mm. at 4,000 Gm. load is well outside the limit of the 2.6 mm. permitted. The average breaking load was 5,500 Gm., which obviously indicates a complete failure to meet the requirements of the specification at the 6,000 Gm. load. These data show that the self-curing resins have a strength of approximately 70 to 90 per cent of that of the heat-cured variety.

COMPLETENESS OF POLYMERIZATION

It is believed that the lower transverse strength of these resins is caused by residual monomer present as a result of incomplete polymerization, since lowering of the transverse strength has been observed in heat-cured resins that were not completely polymerized. In an effort to bring about a more complete cure some of the specimens were boiled in water for half an hour. A definite improvement in the transverse strength was observed (Table 2). However, this procedure completely eliminates the advantages that the self-curing resins possess.

COLOR STABILITY

When tested on the basis of the existing specification requirement for color stability, four of the six brands failed badly, assuming a brownish or yellowish tinge, and two of the materials complied with the requirement. This test, however, is qualitative and relies on a visual inspection of exposed and unexposed specimens. It is not entirely suitable for the self-curing resins because of the tendency of the unexposed specimens to change in color during the period of test. To overcome this difficulty color measurements are now being made with a Hunter Multipurpose Reflectometer. With this instrument it is possible to obtain numerical data which can be converted into N.B.S. units of color difference on a specimen before and after exposure.

Although these resins are not as color stable as the heat-cured materials, there has been a definite improvement in this property since their introduction to the dental profession.

SOLUBILITY AND WATER SORPTION

All of the resins met the requirements of the specification for solubility and water

sorption. The values for water sorption were approximately the same for self-cured and heat-cured resins and varied between 0.5 and 0.7 mg. per square centimeter. The average values obtained for solubility were 0.06 and 0.02 mg. per square centimeter respectively for self-cured and heat-cured resins.

BONDING OF ACRYLIC TEETH TO DENTURE BASE RESIN

One of the more serious defects observed in this investigation was the failure to obtain a satisfactory bond between the plastic teeth and resins during processing. Schoonover[1] and co-workers, at the meeting of the International Association for Dental Research in March 1951, reported a similar failure in the use of plastic teeth with the heat-cured resins. They proved that a trace of wax on the teeth was the primary cause of poor bonding and showed that when the surfaces of the teeth were thoroughly clean, the bond at the tooth-resin surfaces was as strong as the denture base resin. A satisfactory bond was never obtained, however, even with thoroughly cleaned teeth, when self-curing resins were used. It is believed that the rapidity with which polymerization occurs and the lower temperature at which these resins are cured do not permit the diffusion of monomer into the tooth surfaces necessary for good bonding.

Efforts to increase the bonding strength consisted of painting the tooth surface with monomer and monomer-polymer solutions and then subjecting the specimen to a heating cycle at 100° C. These experiments did not improve the bonding. Retention of plastic teeth in self-curing resins must be accomplished by mechanical means at the present time.

Although these resins are inferior to the heat-cured resins from the standpoint of color stability, strength and completeness of polymerization, they are not radically different in these properties. Furthermore, there has been a definite improvement in the self-curing resins pres-

1. Schoonover, I. C., and others. Bonding of plastic teeth to heat-cured denture base resins. See p. 285 of this issue.

Table 2 • Transverse strength

Remarks	Number of specimens tested	Deflection for loads 1,500 Gm to:			Load at failure
		4,000 Gm.	5,000 Gm.	6,000 Gm.	
		mm.	mm.	mm.	Gm.
American Dental Assn. — Specification No. 12.	..	2.6 max.	....	3.0 min. 8.0 max.	....
Acralite 88—True Life.....	10	2.8	4.8	....	6,000
Acralite 88—Tissue Tone.....	10	4.3	....	....	4,900
Bio-Therm.....	10	3.2	7.4	....	5,300
Cold Cure.....	10	3.1	5.9	....	5,700
Cur-O-Matic.....	10	3.4	7.0	....	5,400
Duz-All.....	10	3.0	5.1	....	5,800
Iso-Dent.....	20	3.2	5.8	....	5,600
Heat-cured resin..	60	2.4	3.8	5.9	6,800
Self-cured resin with heat cure*.	5	2.1	3.2	4.6	7,100

*Cure consisted of conventional heat curing cycle at 212° F.

ently available over those initially introduced on the market. It is difficult to evaluate on the basis of the laboratory data presently available how satisfactory these resins will be in service. For this reason a comprehensive investigation is being made of their clinical behavior.

SUMMARY

1. The working time of self-curing acrylic denture resins is of short duration but in most cases is long enough for proper trial packing.

2. The strength of these resins is about 80 per cent of that of the heat-cured resins. They do not comply with the strength requirement of American Dental Association Specification No. 12.

3. Water solubility and sorption properties are satisfactory and meet the specification requirements.

4. The color stability of many brands of self-curing resins is relatively poor.

5. Acrylic teeth do not bond satisfactorily to these resins, and if they are used, some mechanical means of retention must be employed.

Use of self-curing resins in repairing and relining dentures

Frank E. Jeffreys, D.D.S., Newport, R. I.

The self-curing denture resin is not in itself a complete and perfect denture material. Its limitations must be understood, recognized and respected. To determine its position in the field of denture materials and its application in daily practice, the properties of the self-curing resin should be compared with those of methyl-methacrylate, the resin of which almost all dentures are made today. The three chief factors to be considered in a denture material are the length of its processing time, the sufficiency of its transverse strength and the degree of its dimensional accuracy. A comparison of the properties of the self-curing resin and methyl-methacrylate would show that the self-curing resins excel in the shortness of processing time and in dimensional accuracy but fall slightly behind in transverse strength. Because of this deficiency in transverse strength, the self-processing denture resins cannot be recommended as satisfactory for an entire so-called permanent denture base. This lack of strength, however, is slight. Actually the resin is strong and tough; sufficiently so that it can be recommended as an excellent material for the repair of broken and mutilated acrylic dentures.

Presented in a symposium before the Section on Full Denture Prosthesis combined with the Section on Research, ninety-second annual session of the American Dental Association, Washington, D.C., October 17, 1951.

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

Captain, DC, U.S. Navy.

In dimensional accuracy the self-curing resins far surpass the methyl-methacrylates. Full advantage of this important property can be taken when a denture is relined with a self-curing resin. In this operation only a minimal amount of the tissue surface acrylic is removed so that the full strength of the acrylic denture will be preserved. A thin corrective lining is then made of a self-curing resin, which produces a finished product which will have maximum dimensional accuracy.

The self-processing resin can be cured in 5 to 20 minutes at room temperature. With the methyl-methacrylates, it is a different story. Extreme caution must be exercised to prevent warpage and considerable dimensional change in a relined or repaired denture. At best, changes can only be kept to a minimum; they cannot be removed or prevented. When the methyl-methacrylate denture resins are used in rebasing and repairing, the processing must be done at temperatures not exceeding 170° F. and the process must be of at least three hours' duration to lessen the chance of warping the original denture base. It was for the purpose of avoiding these shortcomings of methyl-methacrylate that the self-curing resins were developed and introduced and they have proved of great value. These resins require no lengthy processing at high temperatures, no chilling of flasks and cause no appreciable warpage of the original denture base.

The self-curing resins allow excellent repairing and relining of dentures while the patient waits in the dental office. This removes a possible source of worry and distress to denture patients. The fear of breaking a denture and being deprived of it while the repair is being made is an ever present worry to the prosthetic patient. The embarrassment and difficulty caused a patient when deprived temporarily of an artificial denture is real. It is not always possible for a patient to be secluded during this period. Use of the self-curing resins enables so-called permanent repairs and rebases of prosthetic appliances to be made while the patient waits.

EQUIPMENT

To obtain maximum benefit from the use of self-curing resins the necessary laboratory work must be done in the dental office. It is no longer practical to send a denture which needs repairing or rebasing to the commercial laboratory as the process of transporting it from the dental office to the laboratory and back occupies too much valuable time. If this time factor is ignored and the work is sent to a laboratory, the operator loses the benefit of one of the best qualities of self-curing resin, that of time saving.

The equipment required and the skill necessary for the successful use of the material is small. A denture flask and a press are all that are needed. An assistant can master the laboratory technic in a short time. Plaster, stone and a polishing lathe are generally standard equipment in all dental offices.

TECHNIC

The patient's mouth is checked for any soreness caused by overextension of the denture or any impingement on the tissues. In general, the flanges of most dentures are already underextended and require no shortening or thinning. Almost without exception, however, the labial and buccal notches must be deepened and widened in the preparation of the denture for the impression. If any undercuts are present on the tissue side of the denture, they should be removed. Using a coarse wheel or bur, the edge of the flange and about a quarter of an inch of the outer surface of the denture are roughened.

The most acceptable material to use for a relining impression is one that is very soft and that is fluid enough to flow readily under the denture base. This high

fluidity requirement rules out modeling compound and the thick zinc oxide pastes for these impressions. The ideal impression material must not be sticky or adhere tightly to either the denture base or to the model. This rules out the use of the thin zinc oxide pastes. The impression material should permit the denture to be separated from the model without heating or prying. Alginate hydrocolloid is the material of choice. An alginate that does not require immersion in a fixer prior to pouring the model is preferred.

The denture bearing area of the patient's mouth is wiped dry with a piece of gauze. A half unit of the alginate is mixed and spread over the tissue-contacting surfaces of the denture. Using the tip of the mixing spatula, the buccal and labial fossa and the roof or peak of the vault are filled with the mixed alginate. The denture is placed in position in the patient's mouth and the patient is asked to close his jaws in centric relation. The borders of the impression are then trimmed and developed. In three minutes the alginate will have set and the denture with the impression is removed from the mouth. The excess impression material which has flowed over the outer surfaces and over the teeth is trimmed away. In removing this excess, it is trimmed until the width of the impression material remaining at the border of the denture is about an eighth of an inch wide.

The impression is beaded with a double roll of soft, tacky wax. This wax is adapted about 1 mm. short of the crest of the border of the impression and is wide enough to extend over on the buccal and labial surfaces of the denture and is luted to them. This luting holds the beading firmly in place against the border of the alginate impression even though it cannot be actually fused to the alginate. The purpose of the beading is to keep the stone mix with which the model is to be made from covering the labial and buccal surfaces. An accelerated artificial stone is mixed and the model is poured into the lower half of a denture flask. When the setting of the stone begins, the beading wax is peeled off and the top surface of the stone is trimmed flush from the inner border of the flask to the border of the impression. Tinfoil is applied to the outer surface of the denture and to the exposed stone. The free edges of the tinfoil are turned up, and the upper half of the flask and full-flask are put in position with an accelerated plaster of Paris mix.

As soon as the plaster has set, the flask is opened. The tinfoil provides perfect separation for the stone and plaster. No heating of the flask is required. The alginate impression pulls free from the model and denture. Any remaining beading wax is flushed out and the inner surface of the denture is roughened. The model is postdammed and palatal relief made as required before tinfoiling the model.

The self-curing resin is mixed according to the manufacturer's directions, then is packed and trial closed. When ready for the final closure, the half of the flask which contains the stone model is immersed in boiling water for 20 seconds. Then the flask is closed under pressure. After five minutes, the pressure is released and the flask is opened. The denture is removed and is trimmed and polished. The finished relined denture should now present a shiny, hard, dimensionally accurate tissue-contacting surface. The occlusion must now be checked and any cuspal interferences removed.

Experience has shown that in general when a denture breaks it is because it has become ill-fitting. Simply putting the pieces back together is not the final solution. The correct procedure calls for a relining in conjunction with the repair of a denture. In my practice it is routine to reline every broken denture at the same time that it is being repaired and while the patient waits in the dental office.

In surgical prosthesis where stents are required in conjunction with surgery, the self-curing resin has made the use of modeling compound obsolete. A stent of resin is cleaner and stronger than one of modeling compound and can be worn by the patient without replacement as long as the surgeon desires.

In maxillofacial prosthesis where a so-called permanent appliance is necessary, this technic enables it to be made in the operating room during the progress of the surgery.

CONCLUSIONS

Because of the extremely short processing time required and because of their great dimensional accuracy, self-curing denture resins are recommended as being excellent for relining and repairing acrylic dentures. Because of their deficiency in transverse strength, the self-curing resins are not recommended as satisfactory for an entire so-called permanent denture base.

Naval Training Station

Subgingival curettage in periodontal treatment

Leonard Hirschfeld, D.D.S., New York

Subgingival curettage is such a basic part of periodontal treatment that many of the methods to be described in the following pages are used daily by periodontists and general practitioners. The main aim of this paper, however, is to attempt to describe in detail technics which can make most subgingival instrumentation relatively painless and which should yield a maximum proportion of successfully treated cases.

The inaccurate terms "conservative" and "radical" have been used for years to describe two types of periodontal treatment. For a long time periodontists were in one camp or the other, but in recent years the gap has been closing and the men who do ear-to-ear gingivectomies for every patient who enter their offices and the men who believe that the "conservative" is the only respectable means of treatment, are quickly dwindling in numbers. Generally today the periodontist uses whatever technics he believes are indicated for each case or for each area of the mouth in a given instance.

PLACE OF SUBGINGIVAL CURETTAGE IN PERIODONTAL TREATMENT

Most periodontists feel that incipient periodontitis with shallow pockets should be treated by subgingival curettage, improved hygiene and massage, and elimination of local and systemic etiologic factors where possible. It is in the more advanced cases with greater pocket depth that there are differences of opinion. It is an accepted fact that if the sole instrumentation is curettage, some pockets will recede and disappear but certain crevices will remain. Periodontists who do not do gingivectomies believe that there is a possibility of reattachment of

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the gingival flap to the cementum and that, even when this does not occur, the crevice which is left after successful treatment does not have an ulcerating lining or suppuration, and that there is cessation of the inflammatory process, alveolar destruction and apical progress of the epithelial attachment.

Those who believe in eradicating all pockets believe that the chances of reattachment are negligible and that any deep crevice is a good place for bacteria and debris to collect and a dangerous invitation for continued progress of the destruction. However, all periodontists find subgingival curettage a procedure of major importance. Those who do many gingivectomies and flap operations find that their patients respond to the treatments more satisfactorily and they have a more permanent effect if a certain amount of subgingival instrumentation is performed before, and in most cases, after, their operations.

The main aims of subgingival curettage are (1) to remove all subgingival calculus deposits; (2) to remove granulation tissue in pockets; (3) to cause hemorrhage which can reduce edema and congestion of the gingivae; (4) to remove as much as possible of the epithelial linings of the pockets. In the nineteenth century, Riggs also removed the epithelial attachment right down to the alveolar crest. Some of the advocates of the newer technics, such as the Goldman[1] operation (advocated mainly for intrabony pockets) appear to be returning to this concept. In the methods which are now generally called subgingival curettage, fibers that are still attached to the tooth are not detached. The removal of calculus eliminates an irritant which causes chronic inflammation and edema and the flap then either may shrink (reducing or eliminating the pocket) or hug the root tightly (producing clinical closure of the pocket but generally not reattachment). In other instances a crevice remains although there may be cessation of macroscopic suppuration and inflammation.

Subgingival curettage is important in follow-up treatment because it removes deposits before they become large and hard and it also reduces edema and congestion in areas which may have regressed somewhat.

It is well to know what results to expect of a technic in any given case, because then one knows whether to use it, how long to use it and how thorough one's work has been. In marginal gingivitis and marginal periodontitis, the edema, hemorrhage and redness should disappear and the crevices decrease after thorough instrumentation. If areas of redness remain, they may be easily observed at the next visit. Repeated instrumentation usually clears them up, especially if hygiene and occlusal factors are corrected. In gingival enlargement caused by Dilantin, hormonal factors and nutritional deficiencies, instrumentation can be expected to reduce the enlargement if the gingivae are edematous and red. If they are pink and firm and do not pit upon pressure, they are probably fibrotic and instrumentation will not cause much hemorrhage. Gingivectomy generally is required to remove this type of gingival enlargement.

In the treatment of advanced periodontosis and periodontitis complex, it is also important to know what reaction to expect so that the probable areas and extent of gingivectomies can be estimated. In general, when the gingivae are pink and firm and there is little hemorrhage with instrumentation, there is likely to be little recession even though the pockets may be deep. When the gingivae are edematous and flabby, considerable recession may be expected after a few treatments.

There are certain areas where the best

1. Goldman, H. M. Rationale for the treatment of the intrabony pocket; one method of treatment, subgingival curettage. J. Periodont. 20:83 (July) 1949.

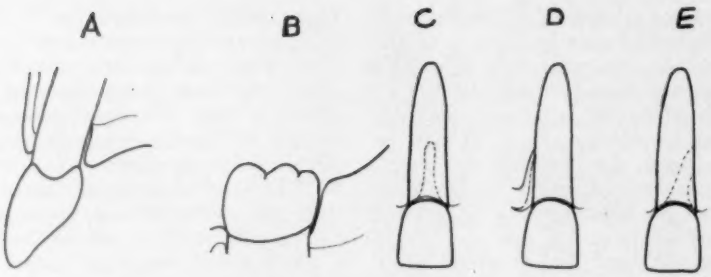


Fig. 1 • Areas where recession may not be expected. A: Lingual to upper anterior teeth. B: In retromolar areas. C: Deep narrow pockets. D: Intrabony pockets. E: Spiral pockets

that may be expected from thorough subgingival curettage is clinical closure of the pocket caused by the gingivae hugging the root surface closely. At other times in these areas there may be great improvement in the tone and the color of the gingivae and cessation of suppuration and hemorrhage but a deep crevice still may remain because of lack of recession. These observations may be made lingual to the upper anterior teeth where the lingual tissue is heavy and fibrous (Fig. 1,A); in retromolar areas (Fig. 1,B); mesial to the upper central incisors where there is a heavy anterior palatine papilla between them; in deep narrow labial pockets where recession is prevented by the tendency of the gingival margin to have gentle curves rather than abrupt ones (Fig. 1,C); and finally, of course, there will be no recession to eradicate an intrabony pocket or a spiral pocket (Fig. 1,D and 1,E). To sum up then, when there is a gingival flap no more than a few millimeters thick and the entire flap is occlusal to the alveolar bone and there is edema and congestion present, the flap probably will recede with treatment. If the pocket is limited to one side of a tooth there will be less recession than if it surrounds the tooth, and if the adjacent teeth have pockets as well there will be greater likelihood of recession.

Another advantage of knowing how much recession to expect is that one can warn a patient before treatment that a certain amount of root exposure may occur. This is better than telling him afterwards that it really was expected that his gingivae would recede, especially when that may have been the patient's original complaint.

ROUTINE OF TREATMENT

A definite sequence of treatment should be followed for periodontal disease although there may be variations in certain instances. At the first visit the mouth is examined and thoroughly charted with the aid of roentgenograms and study models. It is best to photograph the patient's mouth before using any instruments in the examination. Any urgent symptoms are then cared for. At the second visit, the heavy coronal and subgingival deposits are removed from as many sections of the mouth as possible. Some men believe that the removal of deposits should be completed upon one group of teeth in a single visit, but others feel that two or more trips around the mouth are advisable. They do this for several reasons. In the first place, it permits one to teach brushing at an early visit without risking pressing the gingivae against

heavy spiny calculus. If all the treatment is completed before brushing is taught, food will be retained on roots which have been newly exposed by eradication or reduction of pockets, with consequent sensitivity. In addition, many patients require four or five check-ups and corrections before they master toothbrushing technics and if they are not taught until the end of treatment they must make several additional visits. A second reason for curetting a pocket on at least two occasions, is to allow better reduction of edema and congestion.

At the second and third visits the coronal and heavy subgingival calculus is removed and the major occlusal trauma corrected and food impaction mechanisms eliminated. At subsequent visits, the remaining subgingival deposits are removed and curettage is repeated until there is no hemorrhage or suppuration. It is advisable to test the pockets for macroscopic suppuration before each treatment. This is done by pressing with the finger or a blunt instrument on the gingivae beginning at the level of the bottom of the pocket and milking the pus out by pressing slowly towards the gingival margin. It is important to clean the food and debris lightly from the cervix of the tooth before testing for suppuration. The remainder of the occlusal adjustment can be completed after most of the curettage is finished since the initial edema of the peridental membrane probably will be reduced and premature contacts can be determined more accurately.

At the last visit, all the root surfaces are explored carefully with sharp curets for deposits that may have been overlooked, and the pocket depths and tooth mobility are then re-measured and compared with the original chart. If gingivectomies have been planned, they may then be performed.

The most efficient procedure in instrumentation is to select a group of teeth and, using one instrument, care for the same surface of all the teeth in the group. Then another instrument of the same type covers another surface of each of the teeth. When all the surfaces are completed, the next group may be approached. This procedure reduces the number of times instruments must be picked up and put down.

Unless there is an urgent problem in another part of the mouth, the upper or lower six anterior teeth are the best ones to care for first, since the patient will then see immediate improvement in the area most accessible to his vision and will become enthusiastic about continuing the treatment. The same section in the opposite jaw is treated next to enable the patient to masticate in other areas if there should be any postoperative soreness or discomfort. After the anterior teeth, the upper and lower posterior teeth on one side are treated and then those on the other side.

THE INSTRUMENTS

The removal of calculus was considered by even the ancients to be an important part of the treatment of periodontal disease. In the eleventh century, Abulcasis used a complex set of instruments for the purpose. The early instruments were pointed and relatively straight and they dislodged calculus with a push motion. Soon these instruments became curved and then flattened into the sickle scaler, which operated with a pull motion. This sickle became further flattened into the curet form.

There are innumerable designs of instruments and each has its proponents. The ones described here (Fig. 2) are among those used at Columbia University, although other instruments are utilized in certain situations by members of the staff.

In addition to the Zerfing instrument, which is used with a push motion from the labial to dislodge heavy calculus between and lingual to the anterior teeth, there are four main types of instruments,

the sickle, hoe, file and curet (Fig. 3). In each group the operating head of all the instruments is identical but the angles of shaft and neck are varied to bring the cutting edge to any given portion of the tooth at the correct angle. The sickle and hoe scalers are used for removing deposits coronal to the gingival margin and in certain instances they grasp the heavy collar of calculus just below the margin. This is possible because of the looseness of the gingival flap when such heavy calculus is present. The files and curets are used subgingivally as well as coronally and the most desirable ones are small, reducing unnecessary trauma to a minimum. The hoes and files are in sets of four—for the mesial and distal, right and left sides of the tooth. The curets are in sets of two, right and left, and each one has two cutting edges (and a rounded point), thus caring for mesial and distal surfaces.

Each type of instrument has its drawbacks as well as its advantages. Sickles are too large to be used subgingivally. Hoes and files cannot reach to the full depth of the pocket because their cutting edge is not at the very end of the instrument (Fig. 4) and therefore curets must be used to remove the extremely important deposits next to the epithelial attachment. In addition, it must be remembered that hoes and files are flat and that most roots have curved surfaces, so that the files and hoes are placed tangentially to the curves and many strokes must be used to remove the deposits (Fig. 5). Curets, on the other hand, have curved cutting edges and can be used on either flat or curved surfaces. However, files and hoes are more rigid and are useful for removing hard heavy deposits.

USE OF THE INSTRUMENTS

The ideal way to teach instrumentation is to demonstrate it upon a patient, but this paper will enumerate some basic essentials rather than list in detail what instrument is used where.

1. The instrument should be grasped between the thumb and the index and third fingers, but not exactly as one would hold a pen (Fig. 6). In the pen grasp, the instrument rests on the dorsomesial side of the third finger, whereas really it should rest on the mesial side or

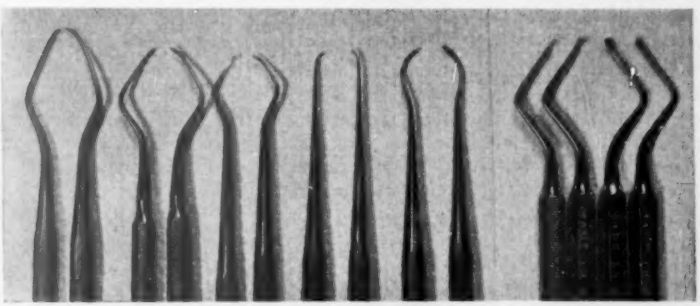


Fig. 2 • A basic set of instruments used primarily for subgingival curettage: the McCall Columbia University 2 L and 2 R, 4 L and 4 R curets; the Good G 13 and G 14 curet; the Hutchinson 1 and 2 curets; the Younger-Good GO 7 and GO 8 scaler and the Hirschfeld-Dunlop files no. 1, 3, 5 and 7. A prophylactic chisel, sickle scalers and the McCall hoe scalers no. 7, 8 and 9 are used in addition for the removal of coronal deposits and those immediately beneath the gingival margin

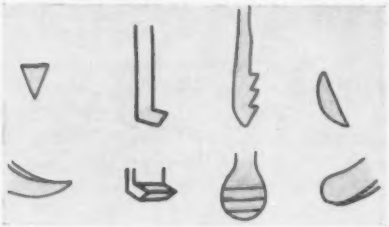


Fig. 3 • The four main types of instruments: sickle, hoe, file and curet

the ball of the finger. The best way to learn the grasp is to turn the palm upward and rest the instrument on the ball of the index finger and the mesial side of the third finger so that it can be rolled backwards and forwards by the thumb. This gives one the correct relationship of the fingertips to the instrument regardless of the angle at which the instrument is held in relation to the hand (Fig. 7). The fourth or fourth and fifth fingers are used for a firm rest.[2] There are many advantages to the fourth finger rest. In the first place, there is great versatility as the instrument can be pivoted on a fulcrum, moved in and out of a pocket on a straight line, or rotated between the fingers. When the third finger is used as a firm rest, there is so much pressure on it at the point of contact with the tooth that its sensitivity of touch at the point where it holds the instrument is practically nil. This reduced sensitivity and the fact that the instrument must be held more tightly when the third finger is used as a rest, causes more pain and detachment of periodontal fibers than otherwise would result.

A third advantage of using the fourth finger as a rest is that the rest or fulcrum does not have to be near the site of operation, and this allows much better vision and increased comfort to the operator and patient. When the instrument curets the mesial surface of the upper right first molar, for instance, (Fig. 8, left), the stiff fourth finger may rest on the central incisors, providing easy access and view. If the third finger were used as a rest, the fulcrum or rest would have to be on the upper right first or second bicuspid. The rest is firmest on one or more teeth, but a fairly good rest can be obtained when working on the buccal surfaces of the upper left posterior teeth by resting the fourth and fifth fingers on the lower left side of the jaw (Fig. 8, right). Fingers of the other hand may be used as additional or accessory rests in some positions when extra control is necessary to prevent skidding. In order to prevent the lower lip from interfering, it may be held down by the operator or the patient (Fig. 9).

2. The instrument is held very lightly in the three fingers, the rest is assured, and then the instrument is introduced lightly into the pocket. As it goes down, it is held loosely so that when it reaches the bottom of the pocket, the attachment is easily felt. If the instrument is grasped tightly, the fingertips are less sensitive and it is not possible to feel the attachment and fibers will be torn, with accompanying pain. As soon as the attachment is reached, the fingers tighten on the handle and a short pull stroke is made towards the mouth of the pocket,

2. Bunting, R. W. Textbook of oral hygiene and preventive dentistry. Philadelphia, Lea & Febiger, p. 172.

Fig. 4 • Diagrammatic representation of the relationships of various instruments to the bottom of a pocket. Left: Hoe. Center: File. Right: Curet

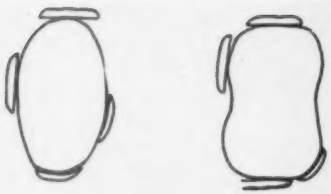


Fig. 5 • Diagram showing the tangential relation of a hoe or file to the rounded surfaces of the roots of incisors and bicuspids (upper and left surfaces of each root) and the way a curved curet is in contact with a greater area

dislodging calculus. Several short strokes are better than one long one and the entire stroke generally should be kept within the pocket. The cementum at the neck of the tooth is thin (Fig. 10) and it may have been decalcified by food retention. If this area is scraped several times by the curet, a sensitive neck will result. The two greatest pain preventers in subgingival scaling are the short stroke and the light exploratory in-movement. If the patient jumps or winces at the end of the in-movement, attachment fibers are being torn; if he winces after the scaling stroke, denuded dentin is being reached and the stroke must be shortened. Sensitive dentin is almost always limited to root surfaces outside the pocket, the main exception being in cases of chronic ulcerative gingivitis, where the craters have acted as food traps and the roots mesial and distal to the craters have become decalcified.

Curets usually will enter a pocket easily, but sometimes it is difficult to insert a file into the mouth of a pocket if the flap is thin. In these instances the file must be tilted temporarily as in Figure 11 and then straightened and wiggled in until the bottom of the pocket is reached.

3. The instrument's cutting edge always should be at the correct angle to the tooth surface. As may be seen in Figure 12,A, the blade should be at about a 45 to 70 degree angle to the surface as it moves occlusalwards. If the angle is more acute than 45 degrees, the calculus will not be scaled off; if it is more obtuse than 70 degrees or at right angles (Fig. 12,B) the distance of the other cutting edge from the tooth is practically doubled and there is much more damage to the gingival flap. This is not serious on the labial and lingual surfaces, where the flap can be stretched, but on the mesial and distal surfaces the adjacent tooth prevents stretching and the tissue is crushed and torn with considerable pain during and after the procedure. If the angle is even greater than a right angle (Fig. 12,C), which happens when incorrect instruments are used, the blade will cut into the cementum and leave a rough sensitive surface.

There are certain times, however, when even the pull instruments, such as the McCall curets, are used with a push stroke. For example, when it is feared that the pull motion may strike the gingival margin of a jacket crown or a silicate filling or where there is a sensitive neck. In using a push motion, it is

Fig. 6 • Method of grasping an instrument while curetting the labial surface of an upper incisor

Fig. 7 • Methods of grasping instruments while curetting lower left posterior teeth, the lingual surfaces of upper left posterior teeth and lower anterior teeth. While the handle is held in a different relation to the hand in each case, the relation of the finger tips to the instrument remains constant. The ball of the index finger, the mesial side of the third finger and the ball of the thumb are generally used

necessary to make the tooth-to-blade angle considerably less than 45 degrees in order to remove the calculus without digging into the cementum (Fig. 12,A, dotted line). The Gracey instruments, which are designed primarily for a push stroke, have the blade at a slightly different angle from the McCall instruments in order to have a smaller-than-45 degree root-blade angle. The push stroke must be very short, especially if the pocket is shallow or if one is removing calculus at the bottom of the pocket.

4. As most of the instrumentation is accomplished below the gingival margin, the fingertips must function as eyes, and it is necessary to differentiate between various types of irregularities on the root surface. The best way to do this is to move a sharp curet down along the root surface (holding the instrument very lightly in order to increase sensitivity) to the bottom of the pocket and then back up again (but without attempting to remove calculus, for that would require a firmer grasp). This procedure is entirely exploratory.

Figure 13 is a diagrammatic representation of the sensations that may be felt. If, in going down the root, the instrument

Fig. 8 • Left: The rest may be a considerable distance from the blade providing easy access and vision. Right: While a tooth is the firmest rest, the lateral surface of the lower jaw may be used when certain upper teeth are being curetted

dips in and does not come out, as in line A, and if in returning it must come out slightly, there is an overhanging filling or crown or an excessively large enamel crown. If the reverse happens, as in line B, there is either a filling which is shy at the gingival margin, a crown which is not as thick as the shoulder of the preparation, or an excessively heavy root, wider than the crown. If the instrument dips in and then comes out again, an erosion or cavity or a defective filling has been en-

Fig. 9 • Left: When the lower lip prevents satisfactory access or vision, it may be held down in the above manner. The third finger is firmly placed under the chin. Right: Certain patients can hold down their own lower lip, permitting use of the mouth mirror for additional illumination

Fig. 10 • Since the cementum at the cervix is thin and frequently sensitive, the curet stroke should be short and should remain within the pocket

countered. If, however, the instrument strikes a ledge and must go outside it and then sinks back in and the same sensation is felt when coming out of the pocket, then heavy calculus is present, as in D. Lighter calculus is felt as a grainy, gravelly surface which must be contrasted to the ivory-like smoothness of the calculus-free root. There may be gentle irregularities or hypercementoses on the root surface, as in line E, but these are not likely to be confused with the sharp definite convexity seen in D. A series of roentgenograms, readily viewable, is a great aid in determining the identity of irregularities on the root surface.

This type of exploring is done before the calculus is removed and must be repeated in detail afterwards. If a small amount of calculus is left in an inaccessible place there will be no cessation of suppuration and a parietal abscess is likely to result. Pockets may be found in peculiar irregular forms (Fig. 14) and it is essential to explore all the borders, no matter how devious, with suitable curets, in order to detect all the calculus. It is especially easy to overlook calculus in the lateral portions of proximal pockets (Fig. 15). The right and left instrument must be used in each proximal pocket. If calculus is allowed to remain deep in a pocket and the rest of the tissue shrinks and hugs the root, the suppuration resulting from the presence of the calculus may have no way of escaping through the mouth of the pocket and a parietal abscess may form. This may resolve itself spontaneously or with the aid of antibiotics, or it may be necessary to incise and drain it. If abscesses rupture spontaneously, a chronic fistula is likely to result, with pus draining through it. This actually may be helpful, because frequently it is possible, by working through the fistula, to remove calculus and perform curettage in areas it was not possible to reach through the mouth of the pocket. This is especially true in the case of a fistula labial to an upper incisor, where the pocket is on the lingual surface but spirals around to the labial. After the curetting is completed, there must be complete chemical or mechanical removal of the epithelial lining of the fistula which was grown in from the outer surface.

5. As has been mentioned before, the three-fingered grasp allows the use of three motions, all of which are valuable —straight-line, rotation and pivoting (Fig. 16). The straight-line stroke is useful especially in deep narrow pockets in the anterior regions, and it is the main

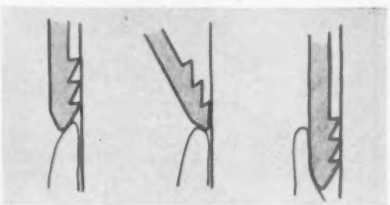


Fig. 11 • Method of inserting a file into a pocket whose flap is thinner than usual at the gingival margin

stroke used with files (Fig. 17,A), since a pivoting stroke can cause uneven application of the file's blades and any circular component would cause grooving of the cementum (Fig. 17, B and C).

When a pocket on the labial or lingual surface is rather shallow, an in-and-out straight-line stroke prevents detachment of the fibers bordering the pocket (Fig. 18). If strokes are made as in the arrows in A, the attachment cannot be torn, whereas if they are made with a pivot stroke as in B, it can be lacerated. The rotation stroke is good for curet instrumentation on the mesial and distal surfaces of posterior teeth. The axis of rotation is the handle of the instrument and the blade describes an arc. This is helpful in certain types of pockets where the base is wider than the mouth of the pocket. If rotation is not used, it is easy to leave deposits near the buccal and lingual borders of the pocket.

The pivoting stroke has advantages when it is comfortable to have the fulcrum close to the tooth being treated and where the shape of the pocket doesn't contraindicate its use. Its main advantage is that it requires the least muscular effort since the fingers do very little work and the wrist and forearm do most of it. The main disadvantages are the necessity of having the fulcrum close to the blade and

Fig. 12 • A: Proper relation of curet blade to tooth—45 to 70 degrees with a pull stroke and 25 degrees with a push stroke (dotted line). B: When the curet blade is at right angles to the tooth, the other cutting edge lacerates the gingival tissue. C: If the blade is at an even greater angle to the tooth, it can dig into the cementum, causing a rough surface

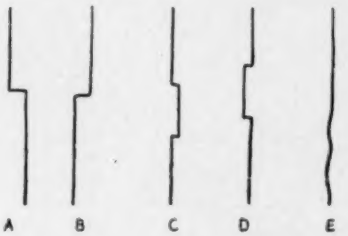


Fig. 13 • Diagrammatic representation of the sensations which might be felt while exploring the surface of a root. A: Overhanging filling or crown. B: Undercontoured filling, heavy root or alveolar process. C: Erosion or caries. D: Calculus. E: Hypercementosis or root irregularity

the fact that the stiffer fingers required tend to reduce the sensitivity to touch of the fingertips. The mouth mirror reflects light on the area being worked on; it affords vision in otherwise inaccessible areas; it retracts the tongue or cheeks and it is used to protect the tongue and cheeks in case a curet should slip.

SHARPENING OF INSTRUMENTS

Although steel is harder than the tooth structure or calculus, the sharp edges of instruments will become dull. Keeping instruments sharp is essential for several reasons: (1) Less time is required to remove the calculus and less damage is done to the soft tissues, reducing pain during and after instrumentation. (2) With a sharp curet, there is a more accurate sense of touch and treatment is more likely to be thorough. (3) A sharp curet performs curettage of the soft tissues with far less pain and with greater effectiveness. (4) Since less force is required to remove deposits with a sharp curet, the stroke can be more easily controlled with less tendency to skid.

Curets may be sharpened with a mounted Moyco Ruby stone or a no. 186 Carborundum stone which has two flat surfaces and two rounded edges, each

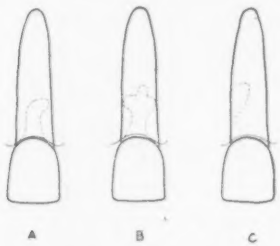


Fig. 14 • Types of pockets in which parietal abscesses are likely to result if the entire border is not carefully explored. A and B: Irregular outlines. C: Spiral pocket

with a different curvature. The smaller curvature is for the smaller curets, the larger for the sickle scaler and large curets. The flat surfaces are used to sharpen the hoe scalers and also may be used to shave down the outer surfaces of the curet blades. Very small knife-edged Arkansas stones or small jeweler's files are used to sharpen the files. The instruments are ground along the dotted lines shown in Figure 19 and they are then tested for sharpness on the fingernail. If a small stroke is made with light pressure, holding the instrument at the angle usually used against the root surface, a minute bit of the nail should be shaved off. If the instrument glides over the nail surface, it requires more sharpening.

ADJUNCTS TO SUBGINGIVAL CURETTAGE

Several types of aids to instrumentation are available. When teeth are loose or when they have thickened peridental membranes, the amount of force required to remove hard calculus causes the patient to fear that the tooth may be forced out and the tooth's mobility interferes with the removal of heavy deposits. The simplest way to counter this pressure is to hold the tooth rigid with a finger of the other hand. A better way is to make two compound blocks, one for the labial surface (cut away to allow work on the lingual surfaces), and one for the lingual surface to permit work on the labial surfaces (Fig. 20). These may be kept from one visit to another and used when necessary. A ligature of dental floss takes only a few minutes to make, and for more permanent stabilization, a stainless steel wire ligature may be constructed.

The treatment of periodontal disease in many dental offices formerly was limited to a superficial cleaning and the use of medicaments. When these did not

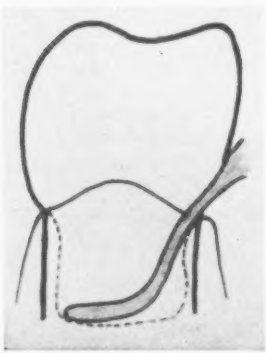


Fig. 15 • The lateral parts of proximal pockets may be difficult to reach and it is sometimes necessary to curet the labial border areas of the pocket from the lingual and vice versa

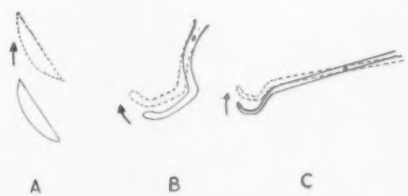


Fig. 16 • Three types of motion possible with the three-fingered grasp. A: Straight line. B: Rotating, with the handle of the instrument being the axis of rotation. C: Pivoting on a fulcrum

succeed, the dentists searched for other drugs. But as periodontia has developed, medicaments have assumed a minor role in treatment. Many men use none at all and others use just a few. In 1908, ammonium hydrogen fluoride was advocated for softening calculus. Its use soon was found to be too dangerous, but if a chemical ever should be found that will soften or remove calculus without damaging the root or periodontal structures, periodontal treatment will become much easier.

Drugs that may be of value generally have one or more of the following aims: (1) to encourage circulation and oxygenation (hydrogen peroxide, 30 per cent—there is considerable controversy about its efficacy); (2) to sterilize pockets (25 per cent hydrogen peroxide and ether, mild protein silver, U.S.P.12—the use of such chemicals in a mouth teeming with bacteria undoubtedly is more of a gesture than an effective procedure); (3) to cause pressure atrophy of the flap or expansion of the pockets (paraffin, gutta percha); (4) to reduce the oral flora in order to prevent or reduce infection (penicillin and other antibiotics); (5) to anesthetize the soft tissue during instrumentation (ethyl aminobenzoate, U.S.P.); (6) to anesthetize the soft tissues and sensitive areas on the roots during instrumentation (procaine).

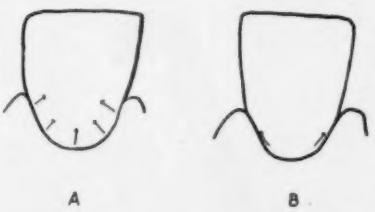


Fig. 18 • When a pocket is shallow, strokes should be made as in A rather than B to prevent painful detachment of peridental fibers

The routine use of topical anesthetics is unnecessary if the instrumentation is skillful and the operator is aware of the various ways of preventing pain. If topical anesthesia is used, he may inadvertently cause more tissue damage, with consequent increased postoperative pain. The topical anesthetics do not reduce tooth sensitivity, but they can be used to prevent any slight pain in the soft tissues when apprehensive patients are being treated. A drop of the solution is placed in the pocket with the curet and after a short time curettage may be started. When there are many sensitive roots in an area, procaine block or infiltration anesthesia is helpful. However, it is important to guard against excessive instrumentation which might remove cementum and cause pain and hypersensitivity of the roots after the anesthetic has worn off. When sensitivity does remain, sodium fluoride, silver nitrate, zinc chloride and other drugs may be used.

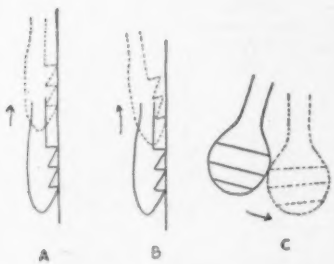


Fig. 17 • A file stroke should be a straight line motion as in A, rather than a pivoting motion as in B or a rotating motion as in C

Fig. 19 • Dull instruments have rounded cutting edges which must be ground with suitable instruments as indicated by the dotted lines

Fig. 20 • A compound block adapted to the lingual surfaces can hold loose teeth firm while the labial surfaces are being treated

Some methods of preventing root sensitivity after periodontal treatment include: proper hygiene, removing food from the necks of the teeth soon after it is deposited there, preventing formation of lactic acid, use of alkaline mouthwashes shortly after meals, and restriction of the use of lemon and grapefruit juice, excessive carbonated beverages, chewing gum and hard candy.

The points to remember which will help to reduce pain from instrumentation are as follows:

1. The appropriate instruments for each area must be used.
2. The instruments should be as small as possible.
3. The instruments must be sharp.
4. The three-fingered grasp, with firm rest positions, allows strict control of the instruments.
5. A more delicate sense of touch will be achieved if instruments are grasped very lightly when entering pockets.
6. The correct relationship of the instrument blade to the tooth should be maintained at all times.
7. Push strokes must be short and well controlled.
8. Pull strokes should be short and generally should be confined to the pockets to avoid sensitive areas on the root surface near the cervical line.
9. Extreme care in using the pivot-type stroke must be exercised in order to avoid tearing peridental fibers bordering pockets.
10. Effective hygiene must be carried out by the patient.
11. When roots are sensitive, the intake of fruit acids preceding treatments should be discouraged.
12. Sensitive roots may be desensitized with one of several drugs.
13. Premedication may be used for unusually apprehensive patients.
14. Topical, conductive or infiltration anesthesia may be used in selected cases.

SUMMARY

Various technics for increasing the effectiveness and decreasing the pain of subgingival curettage have been described. Mechanical and pharmaceutical adjuncts to curettage in periodontal treatment have also been discussed.

730 Fifth Avenue

Cases and Comments

AUTOMATIC SURGICAL MALLET IN REMOVAL OF TEETH

By David Reiter, D.D.S., Woodside, N.Y.

In 25 years of dental and surgical experience I have found the automatic surgical mallet useful not only in surgical cases but also in the removal of teeth.

A gouge type chisel is mounted on the automatic surgical mallet and the spring is adjusted to the mildest and shortest stroke. The chisel is inserted under the gum to the junction of the tooth and alveolar bone on the buccal aspect of the tooth. Several blows are struck. The same procedure is then repeated on the lingual aspect of the tooth. In this way the plates of bone surrounding the tooth are sprung and this enables the operator to insert the beaks of the extracting forceps along either side of the root of the tooth. The beaks can be pushed along the root of the tooth to be removed. The force of the blow may be increased if the tooth is found to be long or the jaw bone massive.

This procedure is completed and a proper roentgenogram taken. If the tooth cannot be delivered with moderate force, I resort to a surgical removal of the tooth. Further use of leverage and force is contraindicated and a flap and surgical removal is by far the best technic.

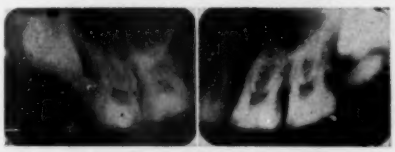
In instances where a flap is necessary, the incision is made sufficiently mesial to the tooth so that the flap, when later sutured, rests on a bony base. Any bone attached to the flap, whose blood supply is injured, should be removed. All sharp edges and spicules of bone should be filed down. This allows better healing and reduces postoperative complications. If infection ensues, penicillin should be given either by injection or by mouth.

5104 Skillman Avenue

BILATERAL SUPERNUMERARY TEETH IN THE THIRD MOLAR AREA: REPORT OF A CASE

By Bertram Blum, D.D.S., Brooklyn

A routine full mouth series of roentgenograms of a white patient, aged 14, revealed bilateral supernumerary teeth in the third molar areas



Supernumerary teeth impacted between second and third right and left maxillary molars

of the maxilla (see illustration). The removal of the two supernumerary teeth was indicated for the following reasons: (1) to allow the normal eruption of the upper right third molar which was impacted between the crown of the third molar and the distal surface of the second molar and (2) to eliminate any possibilities of cyst formation.

The patient was given one and a half grains of Seconal a half hour prior to the operation. He also received 300,000 units of penicillin procaine in oil intramuscularly. Under local anesthesia an incision was made in the mucobuccal fold. The mucoperiosteum was reflected and the overlying bone removed with a hand chisel. The tooth was located and removed, and this was followed by complete curettage of the follicle. All loose spicules and debris were removed and the flap was sutured. The same procedure was instituted on the opposite side. Except for pronounced bilateral swelling, recovery was uneventful and the sutures were removed on the fifth day.

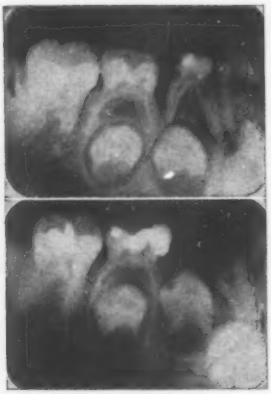
Calcification of the removed supernumerary teeth had advanced almost to complete crown formation. The morphology of these teeth resembled that of a diminutive maxillary third molar.

2761 East 15th Street

PREMATURE LOSS OF FIRST DECIDUOUS MOLAR: REPORT OF A CASE

By Louis B. Kelsten, D.D.S., Newark, N.J.

An 8 year old girl was seen on June 10, 1949, because of an abscessed lower left first deciduous molar (See illustration, above). The affected tooth was extracted, leaving a good intercuspal relationship. After the routine



Above: Lower left first deciduous molar. Below: Six months following extraction

operative work was completed, the patient was dismissed. Although space maintenance was considered, it was decided simply to observe the edentulous area. This decision was based on many reports in the literature which suggest the unlikelihood that loss of a deciduous first molar will cause a local malocclusion.

When the patient returned six months later, the space had closed considerably (illustration, below). The bicuspids had insufficient room for normal eruption, since there would be no further lateral growth in the cuspid area. This condition could now be corrected only by orthodontic intervention.

From observation of similar cases, it may be concluded that space maintenance is indicated in instances of premature loss of deciduous first molars where bone overlies the unerupted permanent tooth.

299 Clinton Avenue

NODULAR CALCIFICATION IN AN ELEVEN YEAR OLD BOY: A CASE REPORT

By Raymond M. Gibbons, D.D.S., and Raymond M. Gibbons, Jr., D.D.S., Buffalo

An 11 year old boy came to our office with an injured upper left central incisor. The mesioincisal angle of the tooth had been fractured when the patient fell at a swimming pool. A large pulp stone in the involved central incisor was noted at this time (see illustration). Since the tooth was still vital, the tooth was given palliative treatment. The pulp was periodically tested for symptoms of necrosis which appeared finally almost two years later. At this time root canal therapy was unsuccessfully attempted and the tooth was extracted.

Full mouth roentgenograms showed all other pulp chambers to be normal. Examination of the roentgenogram of the affected tooth suggests that even if the accident had not occurred the large stone in the central incisor might have caused strangulation of the pulp. Such a case has been described by Roger Stockton in a previous issue of THE JOURNAL (40:585, May 1950).

45 Linwood Avenue

Pulp stone in upper left central incisor of an 11 year old boy

COUNCIL ON LEGISLATION

Testimony of the American Dental Association before the Armed Services Committees of Congress on HR 5904 and companion bills relating to universal military training and service

The American Dental Association's recommendations on the dental aspects of the universal military training program proposed in the report of the National Security Training Commission, together with the Commission's proposed implementing legislation, were presented to the Armed Services Committee of the House of Representatives on January 29, and to the Armed Services Committee of the Senate on February 11, 1952. J. Claude Earnest, of Monroe, La., a member of the Council on Legislation, presented the Association's formal statement. C. Willard Camalier, of Washington, D.C., assistant secretary of the Association, and Mr. Bernard J. Conway of the Central Office staff, assisted in answering the questions put by members of the House of Representatives Committee. Before the Senate Committee, Dr. Earnest was assisted by Mr. Francis J. Garvey of the Central Office staff. The Association recommended that dental services to be provided trainees be limited to the care necessary to enable them to carry out their duties. The Association also stressed safeguarding predental and dental students, who have completed their six months' training under the program, from recall to active duty as Reservists until after graduation from dental school. Finally, the Association recommended that the posttraining liability of the federal Government for dental benefits be limited to the initial correction of injuries and diseases incurred during training.

Mr. Chairman and Gentlemen of the Committee:

I am Dr. J. Claude Earnest of Monroe, Louisiana, a member of the Council on Legislation of the American Dental Association. I am accompanied by Dr. Rudolph Friedrich of Plainfield, New Jersey, chairman of the Council on Federal Dental Services and Mr. Bernard J. Conway of Chicago, Illinois, assistant secretary of the Council on Legislation. We are here today to present the views of the Association with regard to the effect on dental health, dental manpower and dental schools of the bill proposed in the report of the National Security Training Commission.

Section 10 authorizes the training agency, among other things, to furnish dental care to each trainee. It may be impractical to define in the text of the bill the quantity of dental care to be provided but the problem should be discussed in the report of this committee so that the training agencies may have a definite point of reference for the formulation of policies relative to the furnishing of dental care.

The Association believes that the responsi-

bility for good health care rests primarily with the individual and with his family. It recognizes that the failure to exercise this responsibility will result in many inductees presenting themselves to the training agency when in need of dental treatment of varying degrees. However, the Association does not believe that the Government should undertake to repair any neglect on the part of the inductees unless the dental treatment offered is specifically required to permit the members of the Corps to perform their training duties efficiently and comfortably. The American Dental Association therefore recommends that at the time of induction and release each trainee be given a complete dental examination with bitewing roentgenograms. During the period of training dental treatment should in general be limited to early treatment of extensive or advanced caries and periodontal disease and emergency treatment for such conditions as injury, acute oral infections or painful conditions.

This relatively limited program is suggested principally because the Association recognizes that the training period of six months must be devoted chiefly to military indoctrination. A major part of the training period cannot, therefore, be expended in the furnishing of rehabilitative health services. If an extensive program of dental rehabilitation were to be undertaken for members of the Corps it would soon be found that this program was taking a disproportionate amount of training time.

In recommending a limited program of dental treatment, the Association also has in mind the over-all dental manpower problem in this country. During the past year the Armed Forces have cut sharply into the number of dentists available for civilian practice; even more dentists will be lost to the civilian economy when the Armed Forces reach their authorized strength. The quantity of dental treatment to be provided to members of the Training Corps will actually control the amount of dental service available to civilians.

The initiation of this program will have a decided effect on the dental manpower situation. At the present time the ratio of active dentists to over-all population is 1 to 1,900. The armed services employ dentists on a basis of 1 to 500 active duty strength. Thus, every time one dentist enters the service, 1,400 civilians must seek a new place to obtain dental treatment. When the armed services reach their maximum authorized strength there will be about 10,000 dentists on active duty, exclusive of members of the U.S. Public Health Service. The Commission recommends that the training cadre be in addition to the authorized strength of the Armed Forces and presents evidence to indicate that about one trainer will be required for every two trainees. Accepting the Commission's estimate of an average Corps strength of 400,000, this will demand 200,000 for the cadre. If 600,000 persons were to receive dental care from a number of dentists employed at Armed Forces ratios, an additional 1,200 dentists would be permanently lost to the civilian population. Since the permanent dental strength of the regular establishments is only about 1,500, it is readily apparent that when the Armed Forces and the Training Corps achieve maximum strength there will be an average loss to the civilian population, for the duration of the present indefinite emergency, of 9,700 dentists. Thus, these activities will require about 14 per cent of all available dentists in the United States, or 12 per cent if the permanent military dental personnel strength is not included.

It is to the interest of the total population that the number of dentists required by the Training Corps be kept as low as is consistent with good quality dental care in the areas in which it is provided. It is believed that the Association's recommendations for limited treatment will assist measurably in achieving this goal. It is further believed that the intelligent use of Reserve dental officers on day-to-day duty and of civilian practitioners for the purpose of making the initial induction and the final release examinations will tend to reduce the need for excessive numbers of dentists to service the Corps and will also help to lower the cost to the Government of providing the requisite dental care. With federal budgets at today's level it is important to consider fiscal effects when establishing new programs.

After considerable study of the Commission's recommendations for scheduling inductions, as that schedule would affect future dental school enrollments, the Association is willing to recede from its recommendations made to the Commission for a proposed system of student deferment. It is willing to accept the Commission's recommendation that all physically acceptable high school graduates be processed through the Corps during the transitional period between high school and college.

The Commission[1] suggests that a study should be made to determine some system for suspending the liability of certain professional students for posttraining service in the Reserve until the completion of their professional courses. It is the opinion of the Association

1. National Security Training Commission. Universal military training: foundation of enduring national strength. Washington, D. C., Government Printing Office, 1951, p. 28-29.

that such a policy should be determined without further delay since it believes that the practical mechanics of deferment employed by the Selective Service System since 1940 has furnished sufficient experience in the handling of such cases.

The Association has for several years offered an aptitude testing program to the dental schools of the country. It is used by all 42 dental schools at the present time as part of the criteria for determining the admissibility of applicants. The results obtained in these tests will permit the prediction with the expectation of 95 per cent or more accuracy, which students are best equipped to pursue successfully the dental curriculum. This test is now administered as early as the conclusion of the freshman year in college and, with some adjustments, could be offered either to high school graduates or to entering college freshmen who have completed their training in the Corps. Persons who qualified under this test and who could offer otherwise acceptable qualifications to dental schools could be tentatively accepted and be identified as is now the practice under Selective Service. If accepted they could at any time prior to graduation file appropriate evidence with the headquarters of the Reserve component to which they were assigned of their status as a professional or preprofessional student in the healing arts and on the strength of such evidence be relieved from call to active duty until graduation from dental school or until such time as their courses were otherwise terminated.

Policies with regard to the obligation of professional students should be determined and enunciated before the first person is ordered to active duty with the Corps. Such students, if delayed in call-up, would constitute a valuable reservoir of trained personnel for the future health care of the military forces and the nation. Temporary suspension of their obligation to serve would not amount to exemption. It would merely be postponement.

This course will require, however, that equities of the situation be nicely balanced. Under the general theory of the act 18 year olds who have completed training will be transferred to the Reserve for a period of seven and one-half years. Their total obligation would normally be fulfilled at age 26. Under the Association's proposal the postponed obligation of Reserve service would not commence for students of dentistry and medicine until about their twenty-fifth year. Since it is expected that the program will continue indefinitely, in both wartime and peacetime, it can readily be seen that there will be an especial need for trained health personnel at all times. Unless safeguarded by law, dentists and physicians might become particularly vulnerable to recall as Reservists to care for the health needs of this continuing group. In accepting the Commission's recommendation that all should serve in the Corps immediately after graduation from high school, this potential vulnerability of physicians and dentists to recall has been kept in mind by the Association which recommends that provision be made so that members of these professions will not assume a greater amount of service as a matter of course than nondentist and nonphysician trainees. One method of doing this might be to give them credit for service in the Reserve program until such time as their particular class of UMT trainees began to be called for duty as Reservists. At such time the exemption as a student could be claimed with resulting liability for Reserve service after graduation, limited to the period of time during which they were exempted on account of their student status.

To illustrate: A and B reach 18 on the same day and are inducted into the Corps together. At 18½ they complete their training and are transferred into the Reserve. At 19 they enter college where each takes two years of preprofessional training. A then enters law school and B dental school. When they are age 23 and have completed two years of professional school a national emergency occurs which results in their class from the Corps being called to active duty as Reservists. At this time each has completed four and one-half years of service in the Reserve. A enters upon active duty but B claims his exemption as a dental student. A is released after one year of service. Two years later he has completed his entire period of obligated service. B graduates from dental school six and one-half years after release from the Corps. He then resumes his Reserve status and may be called at any time during the succeeding three years, which represents the balance of his obligated Reserve service remaining at the time his obligation was suspended by a claim of exemption as a dental student.

When it appeared before the National Security Training Commission the Association recommended that the liability of the Government for any posttraining dental care be predicated only on clear and convincing evidence that the dental condition was not present at the time of entry into training, that it actually occurred during the period of training and that it was not treated or completely corrected during training. The American Dental Association repeats this recommendation to your committee and adds one additional qualification; namely, that dental treatment for training-incurred dis-

cases or injuries be limited to correction of the dental condition as initially discovered.

The Association believes that this is the time to recognize and assert that the period of training in the Corps which will be undergone by all physically qualified males is an obligation of citizenship imposed by the Congress; that to no person who serves is there due any special reward or claim on the Government on account of his fulfillment of this obligation which will not of itself be hazardous and which in any event could not be avoided without incurring severe penalties under the law. Consequently, there ought not to be provided a system of special benefits and bonuses for former members of the Corps. However, because of his acceptance of the obligation imposed on him, the trainee ought to receive health service care for any injuries or diseases which he incurs as a direct result of his period of training. Such care, however, should be limited to such restoration as can feasibly be made by medical or dental treatment.

In its bill (Sections 16 and 22) and its report[2] the Commission has substantially taken the stand just expressed by the Association. It points out that the Government should develop no extensive program of postservice care for UMT trainees such as is provided to veterans of the Armed Forces under laws administered by the Veterans Administration. It states: "As a matter of principle, we do not believe the many ancillary benefits awarded to military veterans are warranted for trainees in a 6-months' program; we believe the cost would be exorbitant over a period of time, even if, as is expected, the number of trainees who suffered disability as a result of injury or sickness should be very small." The Commission then recommends the adoption of benefits under the Federal Employees' Compensation Act, with modifications, as the basis for providing postservice benefits or for caring for disabilities incurred in service.

The Commission also recommends in Section 33 of the bill the extension of the period of training with the consent of the trainee for the purpose of furnishing hospitalization, medical, dental or surgical care.

Until practical experience with the program demonstrates the need for other benefits, these two suggestions would appear to be both reasonable and just. If the training agencies adopt the recommendation of the Association to require a complete dental examination of the trainee at the time of induction and separation, a comparison of the results of the two examinations will readily indicate what new dental disease or disorder has developed or been incurred during the training period. These dental disabilities could be permanently cured in all but the most exceptional cases if the trainee were to be held in service for a relatively short time for the sole purpose of having his training-connected mouth condition corrected.

If the Federal Employee's Compensation Act is to be adopted as the vehicle for providing postservice health care in cases of training-incurred dental disorders the Association recommends that Title III be added to the bill as proposed by the Commission. Title III, which follows hereafter, would amend the Federal Employees' Compensation Act so as to authorize specifically the rendering of dental benefits. At the present time dental benefits are offered under the act but only by administrative regulations. In order to round out the program proposed by the Commission it would appear necessary to take this step. Since the amendments proposed by Title III are to the basic compensation act, it would not be necessary to make any changes in the Commission-proposed Section 16.

2. National Security Training Commission. Universal military training: foundation of enduring national strength. Washington, D. C., Government Printing Office, 1951, p. 58.

PROPOSED AMENDMENT

Amend HR 5904 on page 24 by adding thereto an additional title to read as follows:

TITLE III

Section 301. Short Title. This title may be cited as the Federal Employees' Compensation Act Amendments of 1952.

Section 302. The first two sentences of Section 9 of the Federal Employees' Compensation Act, as amended, (5 USC 759) are amended to read as follows:

(a) For any injury, sustained by an employee while in the performance of duty, whether or not disability has arisen, the United States shall furnish to the employee all services, appliances, and supplies prescribed or recommended by duly qualified physicians and dentists which,

in the opinion of the Secretary, are likely to cure or to give relief or to reduce the degree or the period of disability or to aid in lessening the amount of the monthly compensation. Such services, appliances, and supplies shall be furnished by or upon the order of United States medical and dental officers and hospitals, but where this is not practicable they shall be furnished by or upon the order of private physicians, dentists, and hospitals designated or approved by the Secretary.

Section 303. The first two sentences of Section 21 of the Federal Employees' Compensation Act, as amended, (5 USC 771) are amended to read as follows:

Section 21. After the injury, the employee, shall, as frequently and at such times and places as may be reasonably required, submit himself to examination by a medical or dental officer of the United States or by a duly qualified physician or dentist designated or approved by the Secretary. The employee may have a duly qualified physician or dentist designated and paid by him present to participate in such examination.

Section 304. Section 22 of the Federal Employees' Compensation Act, as amended, (5 USC 772) is amended to read as follows:

Section 22. In case of any disagreement between the physician or dentist making an examination on the part of the United States and the employee's physician or dentist, the Secretary shall appoint a third physician or dentist, as the case may be, duly qualified, who shall make an examination.

Section 305. The first sentence of Section 23 of the Federal Employees' Compensation Act, as amended, (5 USC 773) is amended to read as follows:

Section 23. Fees for examinations made on the part of the United States under Sections 21 and 22 by physicians and dentists who are not officers or employees of the United States and not under contract to the United States to render medical or dental services to its employees shall be fixed by the Secretary.

COUNCIL ON DENTAL EDUCATION

Data on dental hygienist training programs

The Council on Dental Education and its Committee on the Training of Dental Hygienists has conducted a number of surveys to collect information on the dental hygienist training programs. Data are now complete for the past three years on such information as the placement of graduates, predental training, admission requirements, number of applicants and the total cost for the two year dental hygiene program.

All of the 48 states and the District of Columbia have now enacted legislation providing for the registration and licensure of dental hygienists.

The number of applications for admission to dental hygiene schools during the past three years in comparison to the number of first year students admitted is shown in Table 1.

The total undergraduate enrollment was 1,598 as of October 15, 1951, with 904 enrolled in the first year and 694 in the second year. Corresponding data show 1,454 undergraduates for 1950 and 1,091 for 1949. There were 632 graduates in 1951, 529 in 1950, and 505 in 1949.

All of the 26 dental hygiene schools require the completion of an accredited high school course for admission. As indi-

Table 1. Applications for admission to dental hygiene school

Year	Number of applications	Number admitted	Number of schools
1949–50	1,688	550	18
1950–51	1,968	862	26
1951–52	1,766	904	26

Table 2. Predental training of first year dental hygienists

	1948–49 %	1949–50 %	1950–51 %
High school only	69.3	72.7	73.3
One year of college	13.6	12.2	11.3
Two years of college	12.1	12.6	13.1
Three years of college	1.5	1.0	1.1
Four years of college	3.5	1.2	1.1
Advanced degree	0.0	0.3	0.1

Table 3. Summary of employment data on graduated dental hygienists

Year	Sought employment after graduating %	Secured employment as dental hygienists %	Number of schools
1948–49	97.0	99.0	18
1949–50	95.8	97.0	16
1950–51	92.4	96.6	21

cated in Table 2, about 15 per cent of the hygienists accepted each year have completed at least two years of college training. In 1949, 7.4 per cent of the graduates received the bachelor's degree on completion of the dental hygiene course whereas this percentage was increased to 8.7 per cent in 1950 and 10.9 per cent in 1951. About 9.1 per cent of the 1949 graduates continued in school, while in 1950 there was 7.9 per cent and in 1951 9.2 per cent of the graduated class who remained in school after completing the hygiene course. Most of those reported as continuing in school were doing so on a part-time basis or were attending evening classes.

The data, as shown in Table 3, indicate that a large percentage of the hygienists graduated each year seek employment and that almost all of these are able to secure placement.

The type of placement secured, as indicated in Table 4, shows that dental offices and public school systems account for the employment of at least 85 per cent of the graduates each year.

Most of the dental hygiene schools assist in the placement of their graduates.

Table 4. Type of placement of dental hygiene graduates

	1948–49 %	1949–50 %	1950–51 %
Dental offices	72.6	70.9	82.2
Public school systems	13.0	14.5	11.6
Civil service (federal)	3.4	3.9	0.2
Civil service (state)	2.5	2.8	1.1
Hospitals	4.8	3.3	1.4
Colleges and universities	1.0	1.9	1.4
Industrial clinics	0.2	0.6	0.9
Others	2.7	2.1	1.2

Table 5. Estimated cost to students, exclusive of living costs, to complete the two year course as of October, 1951

	Low	High	Average
Tuition	$000	$1,200	$532*
Instruments	25	200	86
Textbooks	30	115	59
Other fixed expenses	000	480	88
Incidental expenses	000	210	55
Total average	—	—	$821

*The average in each expense classification was based on the charge made to state residents.

Table 6. Dental hygiene schools as of October 15, 1951

State	School or college	Director
California	University of California Medical Center College of Dentistry San Francisco 22, California	Wendell L. Wylie
	University of Southern California School of Dentistry 122 East Sixteenth Street Los Angeles 15, California	Cora Ueland
Connecticut	Fones School of Dental Hygiene University of Bridgeport Bridgeport 4, Connecticut	Robert H. W. Strang
District of Columbia	Howard University College of Dentistry Washington 1, D. C.	Alicia M. Howard
Illinois	Northwestern University Dental School 311 East Chicago Avenue Chicago 11, Illinois	Evelyn Maas
Indiana	Indiana University, School of Dentistry 1121 West Michigan Street Indianapolis 2, Indiana	Rebekah Fisk
Massachusetts	Forsyth Dental Infirmary for Children School for Dental Hygienists 140 The Fenway Boston, Massachusetts	Louise W. Hord
Michigan	University of Detroit School of Dentistry 630 Jefferson Avenue East Detroit 26, Michigan	John H. Greene
	University of Michigan School of Dentistry Ann Arbor, Michigan	Dorothy G. Hard
Minnesota	University of Minnesota School of Dentistry Minneapolis 14, Minnesota	Ione M. Jackson
New Jersey	Fairleigh Dickinson College School of Dental Hygiene Rutherford, New Jersey	Walter Mosmann
New York	Columbia University School of Dental and Oral Surgery 630 West 168th Street New York 32, New York	Frances A. Stoll
	Eastman Dental Dispensary 800 Main Street East Rochester 3, New York	Ruth Vann

State	School or college	Director
New York	Institute of Applied Arts and Sciences Dental Hygiene Training Course 1685 Elmwood Avenue Buffalo 7, New York	George W. Skinner
	Long Island Agricultural and Technical Institute Curriculum in Dental Hygiene Farmingdale, New York	Josephine E. Luhan
	New York State Institute of Applied Arts and Sciences 300 Pearl Street Brooklyn, New York	Mabel Gross
Ohio	Ohio State University College of Dentistry Columbus 10, Ohio	John R. Wilson
Oregon	University of Oregon Dental Schoo 809 N. E. Sixth Avenue Portland 14, Oregon	Evelyn R. Hannon
Pennsylvania	University of Pennsylvania The Thomas W. Evans Museum and Dental Institute 4001 Spruce Street Philadelphia 4, Pennsylvania	Harrison M. Berry, Jr
	Temple University School of Dentistry 3223 North Broad Street Philadelphia 40, Pennsylvania	Gerald D. Timmons
Tennessee	Meharry Medical College School of Dentistry Nashville 8, Tennessee	Eugenia Mabley
	University of Tennessee College of Dentistry 847 Monroe Avenue Memphis, Tennessee	Sarah E. Hill
Vermont	University of Vermont School of Dental Hygiene Burlington, Vermont	J. Edward Marceau
Washington	University of Washington School of Dentistry Seattle 5, Washington	Esther M. Wilkins
West Virginia	West Liberty State College Department of Dental Hygiene West Liberty, West Virginia	W. R. Loper
Wisconsin	Marquette University School of Dentistry 604 North Sixteenth Street Milwaukee 3, Wisconsin	Elizabeth M. Linn

Table 7. Suggested curriculum in dental hygiene

Areas	Suggested total clock hours	Courses	Minimum*	
Basic sciences	600	Pathology	32	
		Anatomy	55	
		Physiology	30	
		Histology	48	
		Dental anatomy	96	
		Chemistry	60	
		Pharmacology	16	
		Bacteriology	72	
		Nutrition	24	
		Total		433
Clinical sciences	700	Clinical dental hygiene		496
Cultural and miscellaneous	350	First aid	16	
		Hygiene	16	
		Dental health education	32	
		Public health	24	
		Sociology	32	
		Psychology	32	
		Ethics, economics, jurisprudence, and office procedure	16	
		Speech	30	
		English	64	
		Total		262
Electives and courses required by institutions	200			
Grand total	1,850			1,191

*None of the required courses should have fewer than the minimum of clock hours listed and the courses in any area should aggregate at least the number of hours listed under the column "Suggested total clock hours."

In 1951, 96 per cent of the schools gave such assistance, with 92 per cent in 1950 and 94 per cent in 1949 assisting in the placement of registered dental hygienists.

The cost of the two year dental hygiene course, exclusive of living cost, shows a considerable variation among the 26 schools reporting in 1951. The ranges and averages of various classifications of expense are shown in Table 5. The average total cost to students, exclusive of living cost, was estimated as $764 in 1949 and as $821 in 1950.

The names, addresses, and the administrators of the 26 dental hygiene schools are listed in Table 6.

A number of conferences on the training of dental hygienists have been sponsored by the Council on Dental Education for the purpose of studying the dental hygiene curriculum. The most recent conference, attended by representatives from 25 schools, developed a suggested curriculum in dental hygiene that could be used for the guidance of new schools and the assistance of schools which felt the need for curriculum revision. Table 7 lists the suggested courses in the dental hygiene curriculum as well as the minimum number of clock hours each course should have. This curriculum was based on the experience of all the dental hygiene schools and the minimum time allocations will be used by the Council in its study of the schools' programs.

For about six years, the Council on

Dental Education has been studying the educational program necessary for training of dental hygienists. The specific requirements for the approval of dental hygiene schools were prepared by the Council and approved by the House of Delegates of the American Dental Association in 1947. The conferences that have been held under the auspices of the Council since that time have all been for the purpose of studying further the criteria and standards that would be used to evaluate the dental hygiene programs. While pilot studies have been made and the Council has collected data for the evaluation of the school programs, no list of approved dental hygiene schools is yet available. The Council at this time has a schedule for the visitation to the schools and hopes to be able to publish a list of accredited dental hygiene schools in the near future.

COUNCIL ON DENTAL RESEARCH

Products added to A. D. A. list of certified dental materials

Since the publication of the most recently revised List of Certified Dental Materials (J.A.D.A. 43:78, July 1951) and the Products Added to A.D.A. List of Certified Dental Materials (J.A.D.A. 43:495, October 1951; 44:81, January 1952) the following materials have been added.

CERTIFIED INLAY CASTING GOLD ALLOYS (A.D.A. SPECIFICATION NO. 5)

TYPE A, SOFT

Alloy	*Manufacturer or Distributor*
Luft "A"	John Luft Prescription Alloys
Mowrey's S-1	W. E. Mowrey Company

TYPE B, MEDIUM

Aleco No. 1	A. L. Engelhardt Company
Mowrey's B-Inlay	W. E. Mowrey Company

TYPE C, HARD

Aleco No. 4	A. L. Engelhardt Company
Mowrey's S-3	W. E. Mowrey Company

CERTIFIED DENTAL MERCURIES (A.D.A. SPECIFICATION NO. 6)

Mercury	*Manufacturer or Distributor*
N.F. IX Redistilled	Mallinckrodt Chemical Works

CERTIFIED DENTURE RESINS (A.D.A. SPECIFICATION NO. 12)

Material	*Form*	*Manufacturer or Distributor*
Improved Justi-Tone T-3	Pink; powder-liquid	H. D. Justi & Son, Inc.
Oryl Brand	Pink; powder-liquid	William Getz Corporation
Coe Acrylic	Pink; powder-liquid	Coe Laboratories, Inc.
Palatex	Pink; powder-liquid	Rockland Dental Co., Inc.

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

Increases in population and number of dentists during 1949-1952

Recently there has been considerable interest in the question of whether the yearly net gain in the number of dentists is consistent with the yearly net gain in population. The Bureau of the Census estimates the total United States population each month. These estimates are based on the decennial census, statistics and estimates of births and deaths provided by the National Office of Vital Statistics, statistics on immigration and emigration provided by the Immigration and Naturalization Service, and data on the Armed Forces provided by the Department of Defense.

The number of dentists dying in a year may be estimated from death rates for white males of the same ages.[1] The difference between this figure and the number of graduates for the year approximates the change in total number of living dentists during that year.

The age distribution of dentists was determined in 1949 from a sample consisting of every eighth dentist recorded in the alphabetic file of the Association's membership department. In order to reduce the effect of sampling error to a minimum, the year-by-year figures derived from this sample were smoothed by means of a five-year moving average. The curve resulting from this operation is believed to represent closely the age distribution of all living dentists in June 1949, and is the starting point for this theoretical study.

To this age distribution were added the graduates of 1949, giving a total of 87,564 dentists on July 1, 1949. This total

1. A study by the Bureau of Economic Research and Statistics entitled "Longevity of Dentists," (J.A.D.A. 39:621 (Nov.) 1950) showed that the average age at death for dentists was about the same as that for white males in general of comparable ages.

Table 1 • Estimated number of dentists and estimated population on July 1, 1949–1952

Date	Population*	No. of dentists†	No. of dentists under 70†	No. of dentists under 68†	No. of dentists under 65†
July 1, 1949	149,149,000	87,574	80,880	79,094	76,279
July 1, 1950	151,689,000	88,580	81,632	79,886	77,061
July 1, 1951	154,353,000	89,809	82,645	80,963	78,057
July 1, 1952	157,064,000	91,066	83,745	82,073	79,087

*Population for 1949 was taken from Statistical Abstract of the United States, 1951, p. 11, Table 10. Populations for 1950 and 1951 were taken from Current Population Reports, Series P-25, No. 55, Bureau of the Census, December 20, 1951. Population for July 1, 1952, was estimated on the assumption that the percentage growth for the year ending that date will equal the percentage growth for the previous year.

†Changes in number of dentists were derived by applying death rates from Table 5, "Life Table for White Males in the United States: 1939-1941," United States Life Tables and Actuarial Tables, to the age distribution of dentists as determined by a random sample consisting of every eighth dentist recorded in the Association membership department file of dentists in mid-1949. Estimates for a given year include dentists graduating in that year. The number of seniors (2,901) on October 15, 1951, was used as the number of graduates in 1952.

Table 2 • Increase in population and number of dentists 1949–1950, 1950–1951 and 1951–1952

Year	Population	All dentists	Dentists under 70	Dentists under 68	Dentists under 65
July 1, 1949–1950	2,540,000	1,006	752	792	782
July 1, 1950–1951	2,664,000	1,229	1,013	1,077	996
July 1, 1951–1952	2,711,000	1,257	1,100	1,110	1,030
Total	7,915,000	3,492	2,865	2,979	2,808

Sources: See Table 1.

included retired dentists, graduates of 1949 who were not yet in practice, and all other dentists.

To the age distribution of this entire group, death rates of white males were applied, using the specific rate for each year of age. Graduates in 1950, 1951 and 1952 were added to the group on July 1 of the year of graduation.

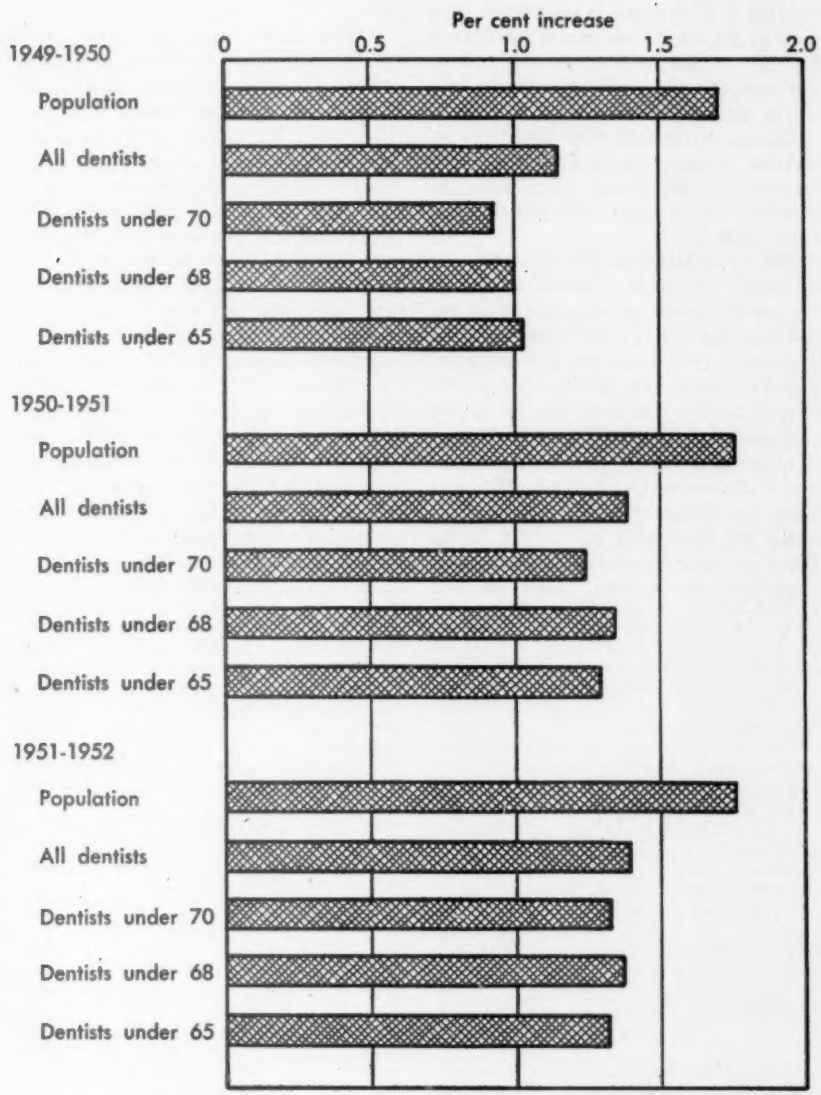
Tables 1, 2 and 3 and the graph show the yearly changes in population and number of dentists. Separate figures are given for dentists under the ages of 70, 68 and 65, to provide a basis for estimating the number of active dentists. There is evidence that the average age of retirement is in the vicinity of 68 or 70; thus the number of dentists under those ages approximates the number of active dentists. In this study 68 will be assumed to be the average age of retirement, and the number of dentists under 68 will be referred to as the number of active dentists.

During the first year of the three-year period under study, the population increased 2,540,000 and the number of active dentists increased 792. In other

Table 3 • Percentage increase in population and number of dentists, 1949–1950, 1950–1951 and 1951–1952

Year	Population %	All dentists %	Dentists under 70 %	Dentists under 68 %	Dentists under 65 %
July 1, 1949–1950	1.70	1.15	0.93	1.00	1.03
July 1, 1950–1951	1.76	1.39	1.24	1.35	1.29
July 1, 1951–1952	1.76	1.40	1.33	1.37	1.32
Three-year period	5.31	3.99	3.54	3.77	3.68

Sources: See Table 1.



Percentage increase in population and in number of dentists by ages, 1949-1950, 1950-1951 and 1951-1952. (Data from Table 3)

words, there was a net gain of one dentist for each 3,207 increase in population. The ratio at the outset was one active dentist for every 1,886 persons; by the end of the year the ratio was one active dentist to every 1,899 persons.

During the second year there was an increase of one dentist for each 2,474 increase in population. The ratio of population to dentists under 68 changed from 1,899 to 1,906.

The population on July 1, 1952 will be about 157,064,000, based on the assumption that the percentage growth for the year ending that date will equal the percentage growth for the previous year. Figures released by the Bureau of the Census for the first four months of the year ending in mid-1952 indicate a continuing rapid rate of growth. The number of seniors on October 15, 1951, was taken as the number of new dentists entering the profession on July 1, 1952. Based on these projections, the ratio of population to dentists under 68 will change from 1,906 to 1,914 during the year.

For the entire three year period, these figures indicate a net increase of one active dentist per increase of 2,657 in population. They also indicate a population growth of 5.31 per cent compared with an increase of 3.77 per cent in the number of active dentists. In order to have maintained the ratio existing in 1949 between active dentists and population, it would have been necessary to graduate approximately 1,215 more dentists during the three year period.

It should be borne in mind that these calculations assume that all dental graduates become active dentists. In this study no account is taken of the increasing requirements of the military services for dentists. Inasmuch as the services have an established ratio of one dentist per 500 servicemen, increasing military services means a decreasing supply of dentists per unit of civilian population.

B. Duane Moen, Director

Four statements adopted by the Inter-Association Committee on Health

The Inter-Association Committee on Health, organized in November 1949, represents six of the major national health and welfare groups in this country: the American Dental Association, the American Hospital Association, the American Medical Association, the American Nurses' Association, the American Public Health Association and the American Public Welfare Association. The Committee serves as a means for the exchange of information so that the participating organizations may cooperate more effectively in improving the health and welfare of the nation. The following four statements, prepared by the Committee and approved by the participating organizations, were released on February 1.

FLUORIDATION OF PUBLIC WATER SUPPLIES

Since scientific reports published 35 years ago on the prevalence of endemic dental fluorosis in the United States, evidence has accumulated demonstrating the influence of small amounts of fluoride on dental health. Too much fluoride in drinking water results in a condition known as dental fluorosis, or mottled enamel; too little is associated with a high dental caries-experience rate. Between these two extremes, however, there is an optimum concentration of fluoride of about one part per million which effectively prevents a substantial amount of dental caries without causing dental fluorosis.

The Problem of Uncontrolled Dental Caries • In the average community not benefiting from fluorides in its water supply, up to 50 per cent of the two year old children have one or more carious teeth, and the caries attack continues at a high rate to the extent that 95 per cent of the population is affected. Dental caries results also in considerable cost for corrective dental services throughout an individual's lifetime.

Unimpeded by preventive measures, dental caries creates a health problem of considerable magnitude because of its high rate of occurrence and its numerous sequelae that result from neglect. Dental defects thus created are accumulating at a rate 4 to 5 times faster than can be corrected by presently available dental personnel. Sound public health practice, therefore, requires a reduction in the size of the problem by the use of effective preventive measures; especially those measures which are applicable on a widespread basis and benefit all persons in the community.

Epidemiological Studies • Epidemiological studies in many areas throughout the United States and abroad have shown that, within certain limits, a consistent inverse relationship exists between the fluoride content of drinking water and the amount of dental caries experience in children, particularly those using fluoride-bearing water continuously since birth. It has been found also that a concentration greater than about 1 part per million, provides little, if any additional benefit. As the concentration increases beyond 2 parts per million, an increasing number of persons has fluorosed enamel that is easily detectable. Numerous investigations have shown that people reared in areas where drinking water contains approximately 1 part per million of fluorine have experienced only about one-third as much dental caries as those reared in areas where the water supplies are fluorine-free. Evidence indicates also that the benefits are retained throughout life.

Studies on Controlled Fluoridation • Studies begun in 1945 indicate that a similar degree of protection against dental caries is found in areas where the fluoride content has been adjusted to an optimum level as is found in areas where the same concentrations occur naturally. Statistical data show a significant reduction

of dental caries in children and there is also evidence to suggest some protection to the teeth of persons who were young adults when fluoridation was undertaken. Continued observations will establish the ultimate degree of effectiveness in older age groups who used fluoridated water during childhood.

Studies on Safety of Fluoridation • There is extensive literature on the pharmacology and toxicology of fluorides. The reports include laboratory investigations as well as studies conducted among people who have lived continuously in areas where the drinking water contains high concentrations of fluorides.

The most sensitive indication of an adverse physiological effect of fluoride ingestion is an enamel defect known as dental fluorosis. Accumulated experience provides no evidence that the prolonged ingestion of drinking water with a mean concentration of fluorides below the level causing dental fluorosis has any harmful effect.

A program involving the adjustment of the concentration of fluoride content in the municipal water supply is especially practical and safe because it is constantly subject to control by competent health authorities and does not require action on the part of individual citizens.

Cost and Engineering Aspects • The cost of fluoridation is small considering its benefits. The cost of equipment has been found to range from several hundred dollars for a small town to about $15,000 for a city of 2,500,000 persons. Annual operating costs vary from 4 to 14 cents per person. These amounts are insignificant when compared with the costs of dental corrective services throughout a person's lifetime.

According to the American Water Works Association, the addition of fluorides to a municipal water supply is feasible from an engineering standpoint. The mechanics of fluoridation are no more involved than those of water purification; moreover, the machinery and equipment commonly used in water plants is easily adapted. Through experience in towns and cities now fluoridating their drinking water, standardized procedures have been developed which include appropriate supervision by official health authorities.

Need for Wider Adoption of Fluoridation • Although studies are still being conducted to determine the greatest amount of protection that may be realized from fluoridation, there is ample evidence to justify its use in any community where the water supply is deficient in fluorides and where the standards established by the state and local health authorities can be met.

There is evidence that the beneficial effects of fluoride bearing water are obtained only after several years of continuous use. Every year that fluoridation is postponed, many thousands of children are deprived of the dental benefits which they might otherwise have obtained.

In order that this effective, inexpensive and safe public health measure may be adopted by additional communities as rapidly as possible, fluoridation must receive the continuing and active support of all professonal, civic and official organizations concerned with the health and welfare of the public.

National Health Organizations With Policies Favorable to Fluoridation • American Dental Association, American Medical Association, American Public Health Association, American Association of Public Health Dentists, U. S. Public Health Service, National Research Council, State and Territorial Health Officers Association and State and Territorial Dental Health Directors.

Resolved, that the Inter-Association Committee on Health urges the fluoridation of the fluoride-deficient public water supplies of this country as rapidly as plans can be approved by the local medical, dental and health department officials and the state departments of health.

HEALTH CARE OF MILITARY DEPENDENTS

The Inter-Association Committee on Health is of the opinion that the health care of the dependents of military personnel constitutes a valid and important claim on the total resources of the health professions.

The Committee does not believe, however, that the Armed Forces should absorb additional professional health personnel to provide such health care for military dependents in the continental United States except where adequate local civilian resources are not available. In view of the fact that this principle is not now being observed in many areas, the Committee recommends that immediate study should be given to this problem by the Armed Forces and the health professions concerned.

PRINCIPLES FOR IMPROVEMENT AND BETTER DISTRIBUTION OF NURSING SERVICES

Achievement of the following objectives is essential for improvement in quality, quantity, and distribution of nursing personnel to meet civil and military nursing needs:

I. Expansion, improvement and continuing financial support of nursing education in order (a) to attract greater numbers of qualified candidates, and (b) to prepare those nurses presently practicing as well as student nurses to meet rapidly changing medical and social demands.

II. Intensive recruitment, both national and local, of students for schools of nursing.

III. Development of sound training programs for auxiliary nursing personnel.

IV. Mandatory licensure for nursing as an ultimate goal. As an intermediate step, mandatory licensure for professional nursing, and permissive licensure for practical nursing. (No attempt will be made to require licensure of various auxiliary workers, such as nursing aides, orderlies, etc.)

V. Promotion of such economic and other conditions of employment as would attract and retain an adequate number of competent nursing personnel.

VI. Furtherance of research in nursing service practice to determine the functions of various categories of nurses so that nursing resources can be utilized more effectively.

In approving the above principles, the six component organizations of the IACH imply no agreed opinion with respect to any particular type of financial support, voluntary or governmental, and reserve their individual rights to support or oppose any particular form or source of support.

CONFIDENTIALITY OF PUBLIC WELFARE RECORDS

It is basic to the code of ethics of the health professions that information regarding the health of a patient secured in a professional relationship must be treated as privileged and maintained in confidential status. This code of ethics applies to all individuals regardless of whether they pay for their own care, are treated under public or voluntary health auspices, or receive health care or examination as a part of the public assistance program. A large number of social case records of the public welfare agencies contain medical records and information necessary to the establishment of eligibility for assistance and/or medical services, therefore:

The Inter-Association Committee on Health urges that information involving health services, diagnostic information or data by which diagnosis is made or treatment provided for recipients of public assistance, which may be contained in social case records and public assistance records, be maintained in confidential or privileged status in order that the rights of the patient be protected and full cooperation of the health professions assured.

LON W. MORREY, D.D.S., EDITOR
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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Editorials

Self-curing resins in dentistry still in the developmental stage

The Council on Dental Research, in cooperation with the National Bureau of Standards, has spent many long months and much effort studying various aspects of the self-curing resins as applied to dentistry. The results of some of these studies were reported at the ninety-second annual session of the Association last October. These reports, together with the reports of several other researchers who have concerned themselves with this newest type of material, are published in this issue of THE JOURNAL in order that members may have ready access to the latest information.

The discovery by German scientists during World War II that methyl methacrylate resin can be polymerized at room or mouth temperature has had a profound effect on dental practice. Even before the war the substitution of acrylic resin for vulcanized rubber revolutionized the field of prosthetics. More recently the potentials of the self-curing resin promised to bring about similar changes in the practice of operative dentistry. The auto-polymerizing resins, widely employed for the repair, relining and rebasing of dentures, for the quick and accurate construction of trays and splints and even as impression material are now being used to some extent as fillings for certain types of cavities. Certainly, dentistry is on the verge of a new and exciting chapter in its quest for an ideal restorative material.

However, as with most new discoveries, the application of the self-curing resins to clinical practice poses many problems which can be solved only by lengthy laboratory research and practical clinical trial and practice. It is apparent that the self-curing resins, although promising, are not in their present stage of development ideal for many dental purposes. Nelsen, Wolcott and Paffenbarger (page 288)

point out, for example, that the expansion and contraction of the direct filling resins during changes in mouth temperature cause the ingress and egress of liquids along the filling margin—a weakness that may predispose to recurrent caries. On the other hand, Seelig (page 261) reports that the adaptation of the acrylic resins to the cavity walls is as satisfactory as that of any other filling material. Dirksen (page 265) observes that the form, color, resistance and efficiency of plastic teeth must be improved. Caul, Stanford and Serio (page 295) report that the strength of the self-curing denture base resins is only 80 per cent of that of the heat-cured resins although their water solubility and sorption properties are satisfactory. Coy, Bear and Kreshover (page 251) summarize their observations of fillings constructed of self-curing resins by stating that further clinical and histologic study is needed before adopting this material for general use.

The doubts that have been raised by investigators indicate that although the self-polymerizing resins have proved practical for certain purposes in dentistry, they have not been found satisfactory for others. Obviously further laboratory research and clinical trial are necessary. The Council on Dental Research of the Association is prepared to do its part to bring about an early solution of the problems concerned in perfecting this newest of dental materials. Until these answers are obtained conservative dentists will use self-curing resins cautiously and only for purposes for which these materials have been proved satisfactory.

Prompt payment of your dues assures maximum Association services to you

The Council on Membership reports that total membership in the Association at the close of last year was 76,229 which is within about one per cent of the all time high, 77,099, reached in December 1950. Approximately 80 per cent of the practicing dentists in the United States are active members of the Association, a record shared by no other national professional organization in the country.

The maintenance of this membership record during 1951 is both gratifying and significant as it was accomplished in the face of a 66.7 per cent increase in Association dues—from $12 to $20 a year. It disproves the prediction, pessimistically made by some, that a raise in dues of such proportions would result in a proportionate loss of members. Events during the past year have demonstrated that the House of Delegates acted wisely in 1950 in establishing the annual dues at $20. This sum multiplied by the total active membership provides the basic income that enables the Association to perform the many essential duties which it owes to its members and to society. In addition it permits the Association to lay aside a substantial sum to rebuild the Reserve Fund which was drawn on so heavily during the postwar period when costs were mounting rapidly but when income remained stationary.

The Council on Membership, the local and state membership committees, and indeed the members, individually and collectively, are to be congratulated on this record. However, there is still some room for improvement—not so much in the addition of members as in the promptness with which members remit their dues. Current dues should be paid prior to December 31 of the preceding year. If every member observed this ruling, local, state and national membership machinery would function more efficiently. Delay in the payment of current dues beyond the first of January results in an additional costly stenographic, bookkeeping, and addressing burden for the societies and irritating inconveniences for the member. Members whose current dues are not received in the Central Office by March 1 are removed from membership rolls and their copies of THE JOURNAL withheld until their dues have been received. Each spring the Central Office is deluged with inquiries from members regarding the nonreceipt of their JOURNALS. Investigation invariably discloses the answer—delayed payment of dues.

Now that the Council on Membership has perfected a mechanism which enables the Association to maintain a maximum membership its next step is to refine that mechanism so as to motivate the prompt payment of dues, thereby minimizing work, waste, inconvenience and irritation.

Dentistry's accrediting standards endangered

Early in January the National Commission on Accrediting, which for the past two years has been studying the accreditation problems of the country's colleges, proposed that existing independent accrediting agencies of the professions be relegated to the status of advisory bodies and that their responsibilities be delegated to the six regional educational organizations in the country such as the New England Assocation of Colleges and Secondary Schools, the North Central Association, and others. Dentistry is particularly concerned over this proposal since its adoption would mean that the responsibility for the accrediting of schools of dentistry and schools for training dental hygienists and dental laboratory technicians would be taken away from the dental profession.

Although the National Commission advises that it has not completed its survey and that it has taken no final action in the matter, it has, nevertheless, requested its member institutions to delay working with the accrediting organizations until its program can be brought to the attention of the several accrediting groups. It is known that the Commission has requested at least one dental school to delay working with the American Dental Association in regard to the accrediting of its school for the training of dental hygienists. Making such a request, without first advising or consulting the accrediting agency of the American Dental Association is, to say the least, undiplomatic and even presumptuous. Such a course of action can only lead to confusion in the minds of educational administrators.

The present anxiety regarding accreditation is not without precedent. Periodically educational administrators become concerned over the growing number of accrediting agencies. Perhaps they have cause for concern as such agencies now number some 300, and a few may be of questionable value. It is inconceivable, however, that the National Commission on Accrediting can rightfully discredit all accrediting agencies because of the errors of a few. On the whole, the present independent accrediting agencies have contributed effectively to the high standards of American educational institutions and it is safe to say that most administrators agree that a competent outside agency can aid materially in evaluating a school's program.

Accrediting, as conducted by the Association's accrediting agency, is not a policing function, but a program of counseling and cooperation in which the accrediting agency aids the schools in studying new methods in teaching and in determining the effectiveness of their educational efforts.

The Council on Dental Education and former accrediting agencies of the Association have earned the respect of the entire dental profession and the dental educational institutions in this country. The Council maintains excellent relations with the universities and colleges that maintain dental schools and schools for the training of auxiliary dental personnel. The Council has brought order out of chaos in dental education and it has aided dental educational administrators to raise the standards of their service and product. The program of the Council on Dental Education and that of other agencies that accredit educational institutions concerned with the health professions must continue in order to help safeguard the health of the nation. The dental profession does not propose to relinquish its responsibility to some less qualified organization.

Washington News Letter

Fluoridation of community water supplies is being challenged by a Congressional committee on the ground that it may have deleterious effects on health. Although the current study is objective and thus far has refrained from condemning fluoridation, the investigators' attitude seems to be that this particular type of protection against caries is still too new to justify claims that it is unqualifiedly safe.

The inquiry is being conducted by a special House group which, since 1950, has been investigating the use of chemical additives in foods. Not until a few weeks ago (February 13), did it turn its attention to fluoridation. At that time, Bruce D. Forsyth, assistant surgeon general and chief dental officer of U. S. Public Health Service, testified in strong support of this phase of preventive dentistry.

Counsel for the House committee closely questioned Dr. Forsyth and his associate, John W. Knutson, on possible relationships between fluoridated water and incidence of cancer. Another subject of interrogation was whether renal diseases may be aggravated by fluorine even in 1 ppm concentrations.

Both witnesses emphasized that fluoridation has been approved, for safety as well as efficacy, by the American Dental Association, American Medical Association, National Research Council and other responsible organizations. "No evidence has ever been produced," said Dr. Forsyth, "that 1.0 part per million of fluoride in drinking water has or will harm any living person or thing."

The committee counsel cited statements claiming that the chemical can produce cancer in mice; that little is known about its cumulative effect in older persons, particularly those suffering from kidney ailments and other chronic diseases, and that studies and observations should be continued for several more years before a clean bill of health can be given to fluoridation of drinking water.

The hearings were scheduled to be resumed later in February and possibly will run over into March, with other defenders—as well as opponents—on the witness list. Chairman of the investigating committee is Rep. James J. Delaney (D., N.Y.).

PENDING LEGISLATION

The dental profession's views on Universal Military Training were reiterated on February 11 when the Senate Armed Services Committee heard testimony by J. Claude Earnest and Francis J. Garvey, representing the American Dental Association's Council on Legislation. Two weeks earlier, the House Armed Services Committee received a statement on the same behalf, which was given by C. Willard Camalier, assistant secretary of the Association.

In each instance, stress was placed on the following points: Complete dental examinations, with bitewing roentgenograms, should be given trainees at beginning and end of their six-months duty; to maintain a steady flow of dental students, their obligated service in Reserve Corps—following the prescribed six-months trainee duty—should be deferred until completion of their professional education; health and dental care privileges now available to veterans of the Armed Forces should not be extended to persons who have taken military training.

The same two committees of Congress also have under consideration proposed legislation authorizing the commissioning of women dentists in the Army, Navy and Air Force on same basis as men. Department of Defense has indicated that it intends to press for enactment. Chances are regarded as fairly bright, since the Navy Department opposition that was responsible for the bill's defeat nearly two years ago (it was passed by Senate but pigeonholed in House) will not be renewed this year, according to officials at the Pentagon.

DRAFT OF DENTISTS

Military need for dental manpower was demonstrated in February, when it was announced that Selective Service has been called on to furnish 335 for induction. Of this total, 200 are scheduled for Navy duty, 85 for Army and 50 for Air Force. As in the past, all names will be drawn from the Priority I pool, with the youngest being the first to be summoned. Final week in March has been selected as the period when prospective inductees will be ordered to report to their draft boards. In the meantime, all will receive the opportunity to apply voluntarily for commissions in the service of their choice. Inasmuch as volunteers will be credited against the various states' induction quotas, it is conceivable that some "hold-outs" may escape military service for another undeterminable period. Pentagon officials point out, however, that this latest call-up will come so close to exhausting the

Priority I pool of available dentists that it is reasonably certain that before the end of this year every one will have been picked up.

Selective Service figures, based on state reports, show that at the close of 1951, 2,213 Priority I dentists were in the Armed Forces or held Reserve commissions and were on inactive duty. Approximately 1,000 other special registrants in the same priority were deferred for reasons of professional essentiality, physical ineligibility and dependency obligations. Thus, the number available for induction was only slightly above the 600 mark.

When the Priority I lists are exhausted, Priority II registrants will be the next to be tapped, in accordance with the so-called doctor draft law. As of December 31, 1951, there were 726 names in this reservoir of dental manpower. Of this number, 141 had been found to be physically qualified and placed in 1-A. Already on military duty were 144 others and 143 held Reserve commissions but were inactive. The remainder were in deferred status.

FEDERAL TRADE COMMISSION

Federal Trade Commission has announced acceptance of a stipulation in which Lino-Dent, Inc., a New York City firm, agrees to discontinue representing that application of "Lino-Dent" will produce permanent results in refitting or tightening of dental plates, or will assure permanent comfort.

"The stipulation was approved by the Commission," said its notice, "in accordance with its policy of encouraging law observance through cooperation in certain types of cases where there has been no intent to defraud or mislead."

International Correspondence

NEWS FROM GREAT BRITAIN

At the beginning of February, as this news letter is being written, dental practitioners have a feeling of anxiety and uncertainty about the future of their profession. First, there is a prospect of patients soon having to pay part of the cost of dental treatment under the proposed New National Health Services Bill. Also, the expected passing of a new Dentists Bill will permit dilution of the profession with dental ancillaries.

NEW N.H.S. BILL

When the House of Commons reassembled on January 29, Mr. Butler, the Chancellor of the Exchequer, announced a series of proposals which are calculated to save many millions of pounds and thus improve the financial state of Britain. Among the proposed economies are a number of changes in the National Health Service, including a plan for imposing on patients a schedule of charges for medical and dental services.

Here are some of the points Mr. Butler made in his speech. The Government would keep the expenditure on the N.H.S. within a ceiling of £400,000,000. A charge of one shilling (14 cents) would be made for each prescription dispensed. Legislation has already been passed for this charge when prescriptions are received from a private practitioner; the new charge would be made on prescriptions given in hospital out-patient departments.

With regard to dental treatment, Mr. Butler said the dental profession had done excellent work. However, there are far too few dentists, and the attractions of general practice have led to depletion of the Local Authority and School Service. Dental work is not being done where it is most needed. At present in the School Service taken as a whole, there is only about one dentist to every 8,000 children. This is a shocking condition. We must get supply and demand into balance and make sure that those who most need help get preference.

With this in mind it has been decided to impose a charge of £1 ($2.79) or the full cost if less, for all treatment except dentures, where a charge is already made; but the new charge would not apply to children, nursing or expectant mothers. That should free more dental time for Local and School Services.

The savings from the charges on prescrip-

tions are estimated to be in the vicinity of £12,000,000 annually. In a full year the charge on prescriptions in hospital out-patient departments will save about £500,000 and the saving on the dental charges should amount to about £7,500,000 annually. Surgical appliances are also to be partly charged for and an estimated saving of nearly £500,000 will be made as a result.

The text of the New National Health Services Bill, published a few days after the Chancellor's speech, incorporated all the above changes. There are exemptions from payment and penalties for making false statements.

The dental charges are to be made up to the value of £1 for a course of treatment. Usually this will include everything which the dentist says ought to be done at his first inspection; therefore, the £1 will often cover several visits. That charge is in addition to the one for dentures. Where both treatment and dentures are provided, the total cost to the patient must not exceed the present maximum of £4.5.0 (about $11). Charges will be paid by the patient direct to the dentist.

People getting National Assistance grants (and their dependents) and war disabled pensioners (so long as the charges are in connection with their war disabilities) will be exempt from payment. Others claiming special hardship can be helped by the Assistance Board.

Penalties including imprisonment up to three months and fines up to £100 or both are provided for in the Bill. Up to now there have been no penalties in connection with the N.H.S. Now, however, it would be possible to get certain advantages by making false statements and so the penalty clauses were introduced.

THE DENTISTS BILL

The British Dental Association has issued a statement to its members on the Dentists Bill and its dangers. Some of the points raised in this statement follow.

The Bill, if passed and entered in the Statute Book, would provide for the experimental training and use of ancillary workers to do fillings, extractions and other dental operations that may subsequently be deemed advisable. These ancillaries would not be restricted to treating school children. The General Dental Council, which the new Act would establish, would control the experiment and report to the government then in office the results of the experiment. The wording of the Bill could permit ancillaries to perform prosthetic operations in private offices, since only those ancillaries doing conservation and extractions are required to work in clinics.

While these ancillaries are required to work under supervision, it is not personal supervision. The New Zealand nurses also work under supervision but they can be a hundred miles away from the nearest dentist, whose supervision consists of a visit to their clinic three times a year.

The policy of the B.D.A. is to delete the objectionable clauses if possible, but if this should fail the Association will try to obtain safeguards. The only argument which can be put forward in support of the new ancillaries is the need for something to save the School Dental Service; therefore, the Association believes that these ancillaries, if introduced, should confine their activities to the School Service.

The Association believes that ancillaries should only work under the personal supervision of a registered dentist; that they should only conserve the teeth, and that they should only work in Public Service on children of school age.

This statement was issued before the new charges for dental treatment were made known. With the desire of the Chancellor for dental practitioners to transfer into the School Service, conditions may improve in the next few months. However this present state of affairs is hardly likely to influence the text of the Act. Care must be exercised even if the need of the School Service should not be so great as in the past.

NEW PRESIDENT OF THE B.D.A.

H. T. Roper-Hall is the new president of the British Dental Association in the place of the late E. B. Dowsett. Dr. Roper-Hall was president of the B.D.A. in 1950-51 and has served as secretary-treasurer since last July, when Dr. Dowsett was elected.

John Boyes

Association Affairs

COUNCIL BEGINS INSPECTION OF DENTAL HYGIENE SCHOOLS

The Council on Dental Education will start its inspection of dental hygiene schools for accreditation in March and plans to complete the project by December, it was reported at the Council meeting, January 31-February 1, in the Central Office.

Otto W. Brandhorst, chairman of the Council's committee on training of dental hygienists, reported that 25 of the 26 schools had invited inspection. The American Dental Hygienists Association and the state licensure boards concerned have been invited to send representatives to accompany the Council members on their inspection visits. The inspection teams will be composed of the Secretary of the Council and one or two Council members.

About 1,800 students took the dental aptitude test in October and approximately 3,000 will take it in March for entrance to dental schools this fall, it was reported. The Council voted to continue the present program of administering the test twice a year.

The financial survey of dental schools, conducted by the Council and the U. S. Public Health Service, has been completed and the final results will be published after the May meeting. As reported earlier, the Council expects to begin work soon on its curriculum survey of dental schools, part of its long range program on accreditation. The program calls for revisiting all dental schools every five years and gathering information periodically on the 10 points of accreditation by conducting several surveys each year.

The Council approved seven new hospital internship and three residency educational programs, to bring the present number of approved programs to 107, and the number of dentists involved to 300. A brochure will soon be printed, listing the requirements for approval of the hospital dental service and those for the approval of hospital dental internships and residencies.

B. L. HOOPER APPOINTED TO FILL COUNCIL VACANCY

Bert L. Hooper of Lincoln, Neb., has been appointed to the Council on Dental Education by LeRoy M. Ennis, president of the Association. Dr. Hooper, dean of the College of Dentistry, University of Nebraska, was recommended by the American Association of Dental Schools to fill the unexpired term of Otto W. Brandhorst, who resigned when he became president-elect of the Association.

The *ad interim* appointment of Dr. Hooper extends until the Association's annual meeting next September, when a successor will be elected for the remainder of the term.

COUNCIL FINDS NO SHORTAGE OF DENTAL EQUIPMENT

At the present time, there are no critical shortages in equipment for civilian dentists, it was determined in a fact-finding session of the Council on Dental Trade and Laboratory Relations, February 4, in the Central Office.

The Council met with the American Dental Trade Association, Dental Manu-

facturers of America, and Edward Munn, chief of the dental section, National Production Authority, to discuss a possible shortage of dental equipment.

Mr. Munn reported that dental manufacturers are receiving enough supplies to meet current civilian and military needs, and that they have the assurance that where justified, additional materials will be allocated to them.

The Council requested a survey to determine the number of dental students graduating in June who will enter the Armed Forces and the number entering civilian dentistry, as well as the number of dentists now in the services who will be entering civilian dentistry this year. The future equipment needs of these dentists will then be calculated.

On February 5, the Council met with representatives of the newly formed National Association of Dental Laboratories and discussed problems of mutual concern. The Council voted to recommend to the Board of Trustees that the Association recognize the National Association of Dental Laboratories as the official organization of the laboratory craft.

CIVIL DEFENSE OFFICIALS CONFER WITH SUBCOMMITTEE

The participation of dentistry in civil defense was discussed at a meeting in Washington, D. C., February 13-14, between Association representatives and Civil Defense Administration officials.

Representing the Association were David E. Hunn of Troy, N. Y., and Lloyd Rogers of Detroit, chairman and member respectively of the subcommittee on civil defense of the National Emergency Dental Service Committee. Conferring with them were Russell W. Bunting of Washington, D. C., dental consultant to the Office of Health Services and Special Weapons Defense, and other officials of the Federal Civil Defense Administration.

The subcommittee will study the fields in which the services of dentists would be used most effectively and report to the Committee on National Emergency Dental Service.

LE ROY ENNIS STATES RULES FOR CHILDREN'S DENTAL CARE

Four rules of dental health for the nation's children were listed by LeRoy M. Ennis, president of the Association, on National Children's Dental Health Day, February 4.

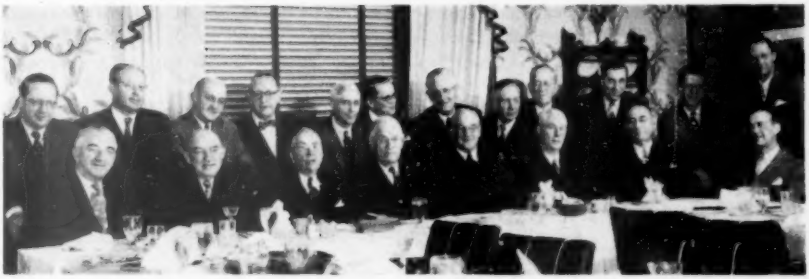
Dr. Ennis recommended the following measures as "practical means of providing children with sound dental health": a well-balanced diet with a minimum of sweets; proper toothbrushing habits, such as brushing the teeth within 10 minutes after eating; early detection and treatment of dental disease; fluoridation of community water supplies or periodic application of fluorides to the child's teeth.

Emphasizing the importance of preventive procedures in combating dental disease among children, Dr. Ennis stated, "The development and expansion of community health programs to make dental health education and care available to all children is the most practical way of improving the nation's dental health."

EXAMINERS AND EDUCATORS DISCUSS TEXTBOOKS, TESTS

Two hundred dental educators and examiners from 35 states, the District of Columbia and four foreign countries, met at the Eighth Congress on Dental Education and Licensure, February 2 in Chicago, to discuss the integration of basic sciences in dental education and the criteria by which the future competence of candidates can be judged.

The Congress was sponsored by the Council on Dental Education under the



Past members of the Council on Dental Education met with present members and staff at dinner on February 2. Standing (l. to r.): Shailer Peterson, B. M. Tylicki, Gerald D. Timmons, Eugene R. Westcott, Bert L. Hooper, H. M. Willits, R. W. McNulty, J. R. Blayney, Wilbert Jackson, G. J. Casey, R. H. Sullens and Harold Hillenbrand.
Seated (l. to r.): F. G. Houghton, R. P. Thomas, H. H. Horner, J. B. Robinson, W. N. Hodgkin, O. W. Brandhorst, M. W. Prince and R. O. Elam.

chairmanship of Eugene R. Westcott of Atlantic City, N. J.

The morning session, which discussed basic science textbooks in dental education, reached the general conclusion that the dental student should have some experience in all phases of the basic sciences through his textbooks and reference books. The consensus favored the specific application of scientific principles to dentistry wherever possible, in part by textbooks through practical illustrations, and in part by teachers through lectures, laboratory demonstrations and clinic work. Harry Lyons, dean of the Medical College of Virginia dental school, was moderator of the discussion.

The afternoon conference, which discussed methods of evaluating the future competence of candidates, seemed to agree that no single examination can be a valid licensure guide. Conferees suggested that many different evaluation technics must be used, and further, they agreed that the evaluation made by a dental school of a student's work is also a significant and useful method of predicting future competence. Dental school achievement and examinations in clinical methods and in applications of theory were conceded to be necessary for a prognosis of success in dental practice. Arthur W. Easton, president of the Maine Board of Dental Examiners, presided at the conference.

A full report on the Congress will appear in a future issue of THE JOURNAL.

ASSOCIATION PROPOSES DENTAL PROGRAM FOR UMT

In testimony before committees of the Senate and House of Representatives, the American Dental Association presented three recommendations on Universal Military Training: (1) that trainees, while in service, be provided only such dental care as will enable them to carry out their duties; (2) that after completing their initial training, predental and dental students be deferred from recall to active duty until their education is completed; (3) that the government's liability for posttraining dental benefits be limited to the initial correction of injuries and diseases incurred during training.

The Association's formal statement (see page 317) was filed with the Armed Services Committee of the House of Representatives on January 29 and pre-

sented to the Armed Services Committee of the Senate on February 11, by J. Claude Earnest of Monroe, La., member of the Council on Legislation.

COUNCIL TO SEEK FACTS ON MUSEUM INVENTORIES

The Council on Dental Museum and Registry, which met in the Central Office on February 4, voted to ask members of the American Association of Dental Schools and other agencies to forward a list of the items in their individual museums.

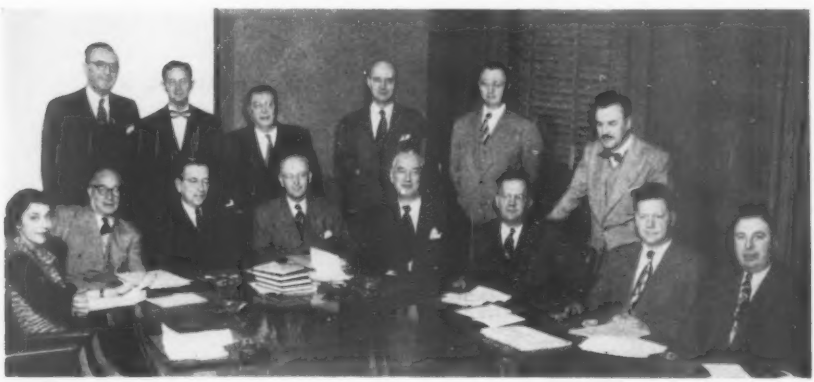
Henry A. Swanson of Washington, D. C., chairman of the Council, also urged dental museums to intensify their efforts in the accumulation of historical dental specimens.

INDEX FOR VOLUME 43 OF THE JOURNAL AVAILABLE

The index for volume 43 of THE JOURNAL, covering issues of the last six months of 1951, has been published. Requests for copies may be addressed to the Order Department, American Dental Association, 222 East Superior Street, Chicago 11.

SIXTEEN SOCIETIES TOP GOALS IN RELIEF FUND CAMPAIGN

Contributions to the 1951-52 Relief Fund campaign of the American Dental Association had reached $85,784.63 as of February 15. More than 26,000 members of the Association had contributed to the drive for $100,000, and 16 societies had oversubscribed their goals. They include



The Council on Dental Trade and Laboratory Relations met with representatives of the National Dental Laboratory Association, February 4-5 in the Central Office, to discuss problems of mutual concern.

Shown at the meeting are (seated, l. to r.) Mrs. Charline Lasker of the Central Office staff; Robert J. Rothstein, president of the National Dental Laboratory Association; Frederick Herbine of Reading, Pa., chairman of the Council; Horace J. Denner, N.D.L.A. member; Allison G. James of Beverly Hills, Calif., Council member; Stanley G. Standard of New York, Council member; Jon Thompson, N.D.L.A. member, and Herbert W. Mason of Indianapolis, Council member.

Standing (l. to r.) are P. M. Cunningham of Cheyenne, Wyo., second vice-president of the American Dental Association; H. L. Stern of the N.D.L.A.; Earl M. Eaton of Cedar Rapids, Iowa, Council member; K. C. Erickson of the N.D.L.A.; Paul Stough of the N.D.L.A., and Paul Slone, executive secretary of the National Dental Laboratory Association.

Alabama, Alaska, Southern California, Georgia, Hawaii, Indiana, Maryland, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, Tennessee, Washington and Wyoming.

Leo W. Kremer of Chicago, chairman of the Council on Relief, asked the further support of Association members to reach the $100,000 goal.

NATIONAL BOARD EXAMINATION TO BE GIVEN APRIL 7-8

Applications for National Board examinations, scheduled to be given April 7-8, must be submitted before March 8, it was announced by Shailer A. Peterson, secretary of the Council of the National Board of Dental Examiners.

The written examinations, which will be held at various dental schools and Army posts throughout the country, are recognized by 26 states, the U.S. Public Health Service and the Army. Applicants for state licenses must also take the practical portion of the state board examinations.

Application blanks may be obtained by writing to the Council of the National Board of Dental Examiners, American Dental Association, 222 East Superior Street, Chicago 11.

Dental Education

DENTAL SCHOOL OFFICERS TO MEET MARCH 23-26

The twenty-ninth annual meeting of the American Association of Dental Schools will be held March 24-26 in Colorado Springs, Colo.

Preceding the regular meeting, a general session is to be held on March 23 featuring five speakers who will discuss problems of particular interest to dental school administrators. Richard Eanes, chief medical officer of the National Selective Service System, will speak on student deferment; Leo J. Schoeny and Paul C. Barton, both members of the Health Resources Advisory Committee of the National Security Resources Board, will discuss dental school facilities in the national emergency. The scholarship plan for dental students will be explained by James P. Hollers, member of the Armed Forces Medical Policy Council of the Department of Defense. Also, Walter J. Pelton, dental director and chief of the U.S. Public Health Service Division of Dental Resources, will discuss the question of whether dental schools should teach the proper use of chairside assistants.

DEANS TO ADVISE ARMY ON DENTAL SCHOLARSHIP PLAN

The Armed Forces Medical Policy Council, now considering the expansion of the proposed Army Medical Scholarship Plan to include dentistry, has asked the deans of all United States dental schools to evaluate the tentative program. As submitted by the Office of the Surgeon General, the expanded plan would institute a long-range program for procuring physicians and dentists for the Armed Forces, through financial aid to students and grants for expansion to schools.

Main provisions of the plan would be:

1. Every approved dental school would be invited to establish a scholarship.

2. Each school would agree to accept one additional student for each scholarship offered, thus increasing the number of graduates.

3. Each scholarship would consist of tuition and a monthly stipend for the student and a grant to the school, to be used for expanding facilities to accommodate the additional student.

4. The dean each year would nominate for the scholarship several candidates from each class; the scholarships would be awarded to one student from each class, selected by the Army Medical Service from the dean's nominees.

5. The students would receive an Army internship after graduation and if qualified, would be commissioned in the regular army. In return, one year of service would be required for each year the student had participated in the scholarship plan and military internship.

The Army Medical Scholarship Plan was indorsed by the Association of American Medical Colleges at its annual meeting last October 30. The possibility of extending the plan to include dental students may be considered at the annual meeting of the American Association of Dental Schools at Colorado Springs, Colo., in March.

M. WEBSTER PRINCE NAMED DEAN OF NEW DENTAL SCHOOL

M. Webster Prince of Detroit has accepted the office of dean of the proposed dental school at the College of Medical Evangelists, Loma Linda, Calif. According to present plans, a modern plant will be built to house the school and the first freshman class of 48 students will enter in September, 1953.

Dr. Prince will give up his private practice and teaching duties at the University of Detroit before September 1 of this year. Long active in dental education, he served as a member of the Council on Dental Education for 10 years.

He is a past president of the Michigan State Dental Association, Detroit Dental Association, Northwestern Dental Club and National Association of Seventh-Day Adventist Dentists. He is a fellow of the American College of Dentists and a member of Omicron Kappa Upsilon and Delta Sigma Delta.

WEST VIRGINIA TO BUILD STATE DENTAL COLLEGE

Blueprints are now being drawn up for the University of West Virginia's new dental college. Part of a planned state health center, the dental school will be located one mile from the present campus of the University at Morgantown, and will share a 145-acre site with a medical college and school of nursing.

The first building to be constructed will be a hospital wing of 200 beds to permit the initiation of the health center program. Wings to accommodate an additional 400 beds will be added as funds become available from the state's soft drink tax, levied by the 1951 legislature to finance the project and estimated to yield in excess of three million dollars per year. Plans for early construction depend on the availability of building materials and the rate at which funds are obtained.

POSTGRADUATE COURSES OFFERED BY DENTAL SCHOOLS

Toronto • Four continuation courses for graduates in dentistry have been arranged by the University of Toronto. Orthodontics, taught by Robert E. Moyers, will be offered March 31-April 4; pedodontics by S. A. MacGregor and G. Nikiforuk, is scheduled for April 14-16; dental oral surgery and anesthesia, under the direction of J. H. Johnson, will be offered April 12-25, and periodontics by H. K. Box and C. H. M. Williams will be presented April 28-May 2.

Enrollment in all classes will be limited. Inquiries may be addressed to the Office of the Dean, Faculty of Dentistry,

University of Toronto, 230 College Street, Toronto 2-B, Ontario, Canada.

Washington • Refresher courses scheduled by the University of Washington School of Dentistry, Seattle, include:

Periodontics by B. O. A. Thomas and staff, April 7-11; modern trends in nutrition by Esther M. Wilkins, April 19 and May 3; dentistry for children by Kenneth A. Easlick, June 17-20; root canal therapy by John I. Ingle and staff, September 8-12. All courses but those on nutrition have class limits from 10 to 20.

Two other courses are tentatively scheduled. Hydrocolloid technic, taught by Morris J. Thompson, William H. Hagen and C. F. Lindley, is scheduled for April 21-23; class limits have not been set. A course in functional analysis of occlusion is scheduled tentatively for July 7-11, with a limit of 25 general practitioners and 25 orthodontists. Instructors will be John R. Thompson, A. C. Heimlich, Cecil Steiner, A. W. Moore, John I. Ingle and J. W. Gallagher.

Further information may be obtained from the director of postgraduate dental education, School of Dentistry, University of Washington, Seattle 5.

DENTAL EDUCATORS TO MEET AT PAN-AMERICAN CONGRESS

The first Pan-American University Dental Congress will be held May 4-10 in Buenos Aires, Argentina. Guillermo A. Bizzozero, dean of the University of Buenos Aires dental school, is president of the Congress. Stanley D. Tylman of the University of Illinois dental school, Chicago, has accepted the chairmanship of the committee representing the United States schools. Further information on the Congress may be obtained from Dr. Tylman at the University of Illinois, 808 S. Wood St., Chicago.

Dental Societies

N. Y. STATE DENTAL JOURNAL ADOPTS NEW FORMAT

The *New York State Dental Journal* appeared with a redesigned cover and format in January. The two-color cover design and typographical changes were first suggested by Daniel Smith, a Chicago artist-typographer, in a speech at the recent meeting of the American Association of Dental Editors.

PANAMA CANAL ZONE DENTISTS ELECT NAVAL DENTAL OFFICER

The new president of the Panama Canal Dental Society is Cmdr. K. L. Longeway, DC, USN, district dental officer of the Fifteenth Naval District. He is the first naval dental officer to be elected president of the society since it was admitted to the American Dental Association in 1930. Lt. (j.g.) F. D. Buckley, DC, USN, of the Naval Station, Rodman, Canal Zone, was elected secretary-treasurer.

The three smiling publicists for Children's Dental Health Day on the Tex and Jinx radio show are (l. to r.) Jinx Falkenberg McCrery, radio and television actress; Dolores Griel, "Princess of Smiles for 1952," selected by the Oral Hygiene Committee of Greater New York, and Patrice Munsel, Metropolitan Opera star, daughter of a dentist.

Norman H. Denner (left), who founded Cleveland's Children's Dental Health Day, forerunner of National Children's Dental Health Day, receives a scroll of appreciation from Harold G. Sheakley (right), president of the Cleveland Dental Society, at a testimonial luncheon February 3. Dr. Denner instituted the first local observance of the day on February 3, 1941, while he was president of the Cleveland Dental Society.

CLEVELAND DENTAL SOCIETY HONORS NORMAN H. DENNER

When the Cleveland Dental Society observed its twelfth annual Children's Dental Health Day on February 3, it honored the founder of the event and the Congressman who promoted its national observance.

The Society presented citations to Norman H. Denner, who instituted Children's Dental Health Day locally in 1941, and the Hon. Michael A. Feighan, Representative from Ohio who introduced H. J. Res. 184, proclaiming Children's Dental Health Day nationally in 1950.

The program for the day included seven limited attendance clinics, a film and four essays on children's dentistry. Charles F. McKhann, M.D., spoke at the luncheon and Rabbi Hillel Silver spoke at the dinner. General chairman of the event was R. C. Beatty.

International

NEW BRITISH BILL TO CHARGE PATIENT FOR DENTAL SERVICE

The New National Health Services Bill was introduced into British Parliament in February, calling for further economies in the National Health Service.

The bill includes a provision for charging patients £1 ($2.79), or the full cost if less, for complete dental treatment, excluding dentures. British dental patients have been paying part of the cost of dentures since last July. The new dental charges, which may cover several visits, is expected to save the British Government £7,500,000 annually. (See "News from Great Britain.")

U. S. DENTISTS ON PROGRAM OF 11TH INTERNATIONAL CONGRESS

A preliminary program of the Eleventh International Dental Congress, to be held in London, July 19-26, has been published, listing the daily schedule of scientific sessions and social events.

The Congress, to be held at the Royal Festival Hall, will include 20 international reports. Among the United States dentists delivering reports are Isaac Schour of Chicago (anatomy and histology); Malcolm Carr of New York (oral surgery); Stanley D. Tylman of Chicago (restorative dentistry); Robert G. Kesel of Chicago (dental caries, eti-

ology); L. I. Grossman of Philadelphia (endodontics); Shailer Peterson of Chicago (dental education); and Balint Orban of Chicago (periodontal diseases, etiology).

Among the dentists who will open discussion on the international reports are J. P. Weinmann of Chicago (pathology); Harold Hillenbrand of Chicago (public dental services); J. A. Salzmann and John H. Sillman of New York (orthodontics); Ernest R. Granger of Mt. Vernon, N. Y. (full dentures); E. W. Skinner of Chicago (dental materials); Harry Sicher of Chicago (anesthesia); C. Marshall-Day of Boston (etiology of dental caries), and John H. Knutson of Washington, D. C. (prevention of dental caries).

Participating in three panel discussions will be Ernest Granger of Mt. Vernon, N. Y.; Victor Sears of Salt Lake City, Utah; M. G. Swenson of Portland, Ore., and C. J. Stansbery of Seattle; H. Trendley Dean of Washington, D. C.; Kenneth Easlick of Ann Arbor, Mich.; Harry Frisbie of San Francisco; Allan G. Brodie of Chicago, and J. A. Salzmann of New York.

Further information may be obtained by writing to Gerald H. Leatherman, Honorary Secretary, 35 Devonshire Place, London W. 1, England.

Special Tours from U.S.A. • Among travel agencies which have arranged special tours to include the Congress are the American Express Company, and Charles W. Carrick, dentist of Oberlin, Ohio.

American Express tours announced by J. B. McAnulty, assistant manager, leave New York on the R.M.S. Queen Mary on July 9, or by air on July 13, and include sightseeing in Brussels, Amsterdam, Cologne, Wiesbaden, Baden Baden, Lucerne, Interlaken, Montreux, Paris, and Cherbourg, as well as in London and the Shakespeare country. A more extensive tour includes Italy in its itinerary. Mr. McAnulty has warned that the demand for accommodations will undoubtedly exceed the supply, and has urged that reservations be made early.

Dr. Carrick has reported that his organization has booked many dentists and their wives for tours in connection with the meeting. Accommodations during the summer months are in great demand, he said, and, judging from the number of dentists who booked tours at the Carrick Travel Agency exhibit during the annual session of the Association in Washington last October, it is imperative that dentists planning to attend the Congress make their plans at once.

BRITISH MISSION TO SURVEY U. S. FLUORIDATION METHODS

A British mission in the United States for one month's survey of fluoridation procedures, will visit the Association's Central Office, March 13-22.

H. H. Stones, editor of the *International Dental Journal* and dean of the faculty at the University of Liverpool, England, is a member of the mission. Others are Alan MacBeth Thomson, a physician of Aberdeen, Scotland; J. Longwell, government chemist, and Miss J. R. Forrest, staff dentist at the Ministry of Health.

DENTISTS OF PUERTO RICO HONOR DEAN A. R. BARALT

The tenth annual assembly of the College of Dental Surgeons of Puerto Rico, January 25-27, was dedicated to A. Raymond Baralt, Jr., dean of the College of Dentistry, Loyola University, Chicago.

Dr. Baralt participated in the congress with three other United States dentists, LeRoy M. Ennis of Philadelphia, president of the American Dental Association; Harold Hillenbrand of Chicago, secretary of the Association, and Col. Lowell McKelvey of the U. S. Army Dental Corps.

A.D.A. REPRESENTED AT FAR EASTERN CONGRESS

The first Far Eastern Dental Congress was held in Manila recently, sponsored by the Philippine Dental Association. Attending were delegates from Indonesia, Nationalist China, the Philippines and the United States. The Indian Dental Association, while unable to send representatives, invited the Congress to meet next year in New Delhi, India. Other nations invited were Burma, Thailand, Vietnam, Australia and New Zealand.

The American Dental Association was represented by Capt. Arthur B. Harris and Capt. John D. Louis, both from the Dental Corps of the United States Air Force. Dr. Harris was elected to the committee arranging for the second Far Eastern Dental Congress, set for February, 1953, in New Delhi.

AMERICAN DENTISTS OF EUROPE TO MEET IN LONDON, JULY 15-18

The American Dental Society of Europe will meet July 15-18 in London, it has been announced by F. Douglas Derrick of London, secretary of the organization.

All United States dentists who will be in Great Britain this summer have been invited to attend. Further information may be obtained by writing to Dr. Derrick at 140, Park Lane, London, W.1.

Public Health

INFORMED PUBLIC FAVORS FLUORIDATION, GALLUP FINDS

Three of every five Americans who have heard of water fluoridation approve of the measure, according to a recent Gallup poll.

Moreover, in cities where fluoridation is now in operation, 11 of every 12 citizens favor the measure, the public opinion poll reports. Fifty-six per cent of the persons questioned had heard of fluoridation; of those who knew about it, three of every five expressed approval, one of every 14 expressed disapproval, and the rest gave no opinion.

DAVID M. WITTER APPOINTED OREGON DENTAL HEALTH CHIEF

David M. Witter, director of the division of dental health of the South Dakota Board of Health, has accepted the same position with the Oregon State Board of Health.

USPHS ADDS THREE MEMBERS TO DENTAL ADVISORY COUNCIL

Three new members have been appointed to the National Advisory Dental Research Council of the U. S. Public Health Service. They are A. P. Black of Gainesville, Fla.; Francis J. Reichmann of Oklahoma City, Okla., and Mrs. Stephen J. Francisco of Little Falls, N. J.

Dr. Reichmann, an oral surgeon, is a member of the Association's Council on Federal Dental Services. Dr. Black is head of the department of chemistry at the University of Florida. He is past president of the American Waterworks Association and is author of books and articles on water treatment (see February issue of THE JOURNAL). Mrs. Francisco is vice-chairman of the National Health Council's advisory committee on local health units, representing the General Federation of Women's Clubs.

The National Advisory Dental Research Council met in Washington in February to pass on 16 applications to

the U. S. Public Health Service for research and construction grants-in-aid, totaling $130,640.

E. H. GALE ASKS APPROVAL OF FUNDS FOR FLUORIDATION

E. Harold Gale of Albany, N. Y., chairman of the Council on Legislation, testified before the House of Representatives Appropriations Committee on February 19 in support of the fluoridation appropriation included in the federal budget. Dr. Gale asked for an increase in the allocation from $250,000 to $750,000.

The appropriation would provide grants-in-aid to the states for technical assistance in fluoridating communal water supplies. This is the first federal budget to include an item for this purpose.

Dr. Gale also urged the Committee to add to the budget $1,900,000 to construct a building for the National Institute of Dental Research. Dr. Gale was assisted in answering the questions of Committee members by Francis J. Garvey of the Central Office.

INTER-ASSOCIATION COMMITTEE URGES FLUORIDATION

The Inter-Association Committee on Health, representing six of the major national health and welfare groups in the United States, recently urged vigorous support of fluoridation by all professional civic and official organizations.

In a statement released February 1, the Committee resolved "that the Inter-Association Committee on Health urges the fluoridation of the fluoride-deficient public water supplies of this country as rapidly as plans can be approved by the local medical, dental and health department officials and the state departments of health." (See page 331.)

The resolution was adopted unanimously by the Committee's member organizations, which include in addition to the American Dental Association, the American Hospital Association, American Medical Association, American Nurses' Association, American Public Health Association and American Public Welfare Association.

SEMINAR ON DENTAL PROBLEMS IN INDUSTRY TO BE HELD

The "first industrial dentistry seminar" will be presented April 10-11 in New York, by the postgraduate division of New York University's dental school and the Institute of Public Health and Industrial Dentistry, in cooperation with the First and Second District Dental Societies of the State of New York.

The aim of the seminar is "to focus attention . . . on occupational health problems that are emerging in dental practice."

Panels to be presented include "Dentistry in Occupational Health," "Oral Health and Workmen's Compensation," "Oral Health Conservation in Industry" and "Preventive Dentistry and Mouth Hygiene in Industrial Medicine." Bruce D. Forsyth will deliver one of the evening lectures on "The Dentist's Responsibilities in Public Health and Occupational Health."

General chairman of the seminar is Alfred J. Asgis of New York. Further information may be obtained from the Office of the Dean, New York University College of Dentistry, 209 East 23rd Street, New York 3.

DETROIT LIBRARY OFFERS FLUORIDATION BIBLIOGRAPHY

The Detroit Public Library's Municipal Reference Library has compiled a bibliography on the fluoridation of public water supplies. Copies will be sent free of charge to interested dentists and public health officials. The address is 1705 Water Board Building, Detroit 26.

Veterans Administration

TUSKEGEE VA DENTISTS PLAN INSTITUTE ON PUBLIC HEALTH

The dentist's role in public health will be investigated at an institute on public health, May 16-19, sponsored by the Dental Service of the Veterans Administration Hospital, Tuskegee, Ala. Participants in a symposium on water fluoridation and the dental caries problem will be J. F. Volker, dean of the University of Alabama dental school; Sidney Finn, professor of dentistry at the University; Carl Sebelius, director of the dental hygiene service of the Tennessee State Health Department, and Zachary M. Stadt, dental health officer of the Charlotte (N.C.) Health Department. Polly Ayers, director of the Jefferson County (Ala.) Bureau of Dental Health, will also participate in the institute, speaking on public health aspects of dentistry.

BACKLOG OF DENTAL CASES DECREASES, VA REPORTS

Veterans Administration figures reveal that during December, dentists in private practice completed 27,111 cases and examined 16,023 patients for the VA. The Veterans Administration expended $2,754,372 for these services. At the end of the year, pending cases numbered 117,230, fewer than any year since the end of World War II.

National Defense

300 PRIORITY I DENTISTS TO BE DRAFTED BY APRIL

Between 300 and 400 dentists will be drafted by April 1 unless volunteers fill critical vacancies, it was announced by the Defense Department on February 11. The first draft call for dentists since the outbreak of the Korean war has been ordered because of the decline in the number of dentists volunteering for commissions.

Dentists to be drafted presumably will be selected from Priority I registrants, those who participated as students in specialized service training programs and those who were deferred from service during World War II to attend dental school and who served less than 90 days in the military forces.

According to Selective Service figures, 629 dentists are available in Priority I. Those whose birth dates range from 1921 to 1927 will be called up first, with these quotas to be filled: 1921—28, 1922—79, 1923—92, 1924—77, 1925—40, 1926—12, and 1927—5.

About 200 of the draftees will go to the Navy, 85 to the Army and at least 50 to the Air Force.

Dentists who are drafted under the "doctor draft law" will enter the armed services without commissions. However, a dentist may volunteer for a commission and enlistments will be accepted up to the date on which induction orders are received. According to states, the Priority I dentists who have not yet applied for commissions, thus liable to draft as privates, include: Arkansas, 7; California, 54; Colorado, 4; Connecticut, 9; District of Columbia, 2; Florida, 7; Georgia, 3; Idaho, 3; Illinois, 28; Indiana, 16; Iowa, 6; Kentucky, 8; Lou-

isiana, 2; Maryland, 6; Massachusetts, 28; Minnesota, 18; Missouri, 10; Montana, 1; Nebraska, 3; Nevada, 3; New Hampshire, 1; New Jersey, 37; New Mexico, 1; New York, 190; North Carolina, 4; North Dakota, 1; Ohio, 40; Oregon, 14; Pennsylvania, 27; Rhode Island, 5; South Carolina, 1; Tennessee, 2; Texas, 4; Utah, 6; Virginia, 6; Washington, 19; West Virginia, 7; Wisconsin, 18; Hawaii, 2, and Puerto Rico, 8.

ADMIRAL R. S. DAVIS RETIRES FROM NAVY DENTAL CORPS

Rear Admiral Robert S. Davis, DC, USN, chief of the Dental Division in the Navy's Bureau of Medicine and Surgery, from June 1943 to July 1945, retired on February 1.

Just prior to his retirement, Admiral Davis served as the district dental officer of the Twelfth Naval District and as in-

To insure the best in dental care for its personnel in outlying units, the Air Force has purchased several dental vans. One of them, pictured here, will travel with the 28th Air Division (Defense) from headquarters at Hamilton Air Force Base, Calif., to divisional units in northern California and western Nevada. The huge tractor-trailer unit contains two chairs, x-ray equipment and a laboratory and has its own power plant and air conditioning.

Capt. Philip Manners of New York City, shown in the doorway (below), is in charge of the van. In addition to Captain Manners, the traveling dentistry team includes 1st Lieut. Harry E. Stanton and Sgt. Stanley Batter. Captain Manners was graduated from Columbia University's dental school in 1944, Lieutenant Stanton was graduated in 1947 from the University of Southern California College of Dentistry, and Sergeant Batter was a pre-dentistry student at La Salle College, Philadelphia, in 1949-50 before entering the Air Force.

spector of Navy dental activities on the Pacific coast. He had previously served in the same capacity on the East coast.

A graduate of the University of Pennsylvania's dental school in 1915, Admiral Davis served two years as an instructor in dentistry at the University and in 1917 joined the Dental Corps of the Navy. During his 34 years of continuous active duty, his assignments were varied and he was decorated in both wars. He is a fellow of the American College of Dentists and a member of Omicron Kappa Upsilon.

DENTAL CARE FOR DEPENDENTS OF COAST GUARDSMEN ASKED

A bill (HR 6212) directing the Commandant of the Coast Guard to provide, along with medical care, "dental care and treatment for dependents of personnel of the United States Coast Guard," was recently introduced by Rep. Herbert C. Bonner (D., N.C.). The bill has been referred to the House of Representatives Committee on Merchant Marine and Fisheries.

AIR FORCE DENTAL SURGEONS MEET FOR ANNUAL CONFERENCE

The Air Force Dental Corps held its annual Major Command Dental Surgeons Conference February 7-8 in Chicago. Maj. Gen. George R. Kennebeck, chief of the Air Force Dental Services, conducted the conference; Col. John K. Sitzman, representing the office of the Surgeon General, presented items of policy affecting the corps.

Command dental surgeons who participated were Col. Jack D. Collins, Col. Robert D. Johnson, Col. Lee M. Lightner, Col. Jack M. Messner, Col. Edmund F. Wipf, Lt. Col. John R. Eastman, Lt.

Dental officers, technicians and assistants of the U. S. Naval Hospital in Yokosuka, Japan, are shown in front of the hospital. First row (l. to r.) DTC D. G. Stallbories, Lt. (j.g.) R. E. Coy, Lt. (j.g.) W. H. Barnett, Lieut. C. C. Williams, Cmdr. R. F. Huebsch, Cmdr. E. A. Goldsmith, Capt. B. H. Faubion, Cmdr. K. E. Merriam, Cmdr. H. C. Sivik, Lt. (j.g.) N. R. Ascherman, Lt. (j.g.) S. Saul and Lt. (j.g.) J. A. Freese.

Naval personnel in the third row (l. to r.): R. J. Pierce DTP2, J. A. Belgard DT1, W. L. Hageman DT3, J. W. Sidney DT1, D. R. Harry DT1, J. J. Muraoka DTP3, D. P. Lawrence DT2 and J. C. Robinson DT3. Fourth row: E. H. Mahl DTG3, D. M. Williams DT3, G. Willis DT1, D. G. O'Neil DT3, L. B. Sitterson DT1, E. O. Butt DTP3, J. C. Dobbins DN, and J. Harvey DT1.

Five members of the staff were absent: Cmdr. J. L. Bradley, Lieut. E. E. Flesher, R. F. Cowles DT2, E. H. Williams DN, and R. D. Brooks DN.

Col. Kenneth Elwell, Lt. Col. Sydney G. Gordon, Lt. Col. William R. T. Oakes, and Maj. Douglas C. Wendt. Each reported on dental service in his respective command.

Rear Admiral A. W. Chandler, inspector general of the Dental Division in the Navy's Bureau of Medicine and Surgery, is shown in Korea during his recent 37-day flight around the world. In Korea, Admiral Chandler inspected the dental department aboard the Naval Hospital Ship, USS Repose, and the dental facilities which accompanied the U. S. Marine Corps First Division during their offensive north of the 38th parallel.

ADMIRAL DANIEL RYAN NAMED CHIEF OF NAVY DENTAL CORPS

Rear Admiral Daniel W. Ryan, United States Navy Dental Corps, has been named assistant chief of the Bureau of Medicine and Surgery for Dentistry, and chief of the Dental Division, succeeding Rear Admiral Spry O. Claytor, who recently retired.

D. W. Ryan

Admiral Ryan formerly served as head of the dental department at the United States Naval Academy, as command dental officer for the Severn River Naval Command and as district dental officer of the Ninth Naval District.

A native of Iowa, Admiral Ryan received his D.D.S. from the University of Denver School of Dentistry in 1923. He is a fellow in the American College of Dentists and the International College of Dentists.

General

I. C. SCHOONOVER NAMED TO N.B.S. DIVISION POST

Irl C. Schoonover, chief of the Dental Research Laboratory of the National Bureau of Standards, has been appointed assistant chief of the Organic and Fibrous Materials Division.

A chemist of international note, Dr. Schoonover has directed the research program on dental materials being conducted at the National Bureau of Standards in cooperation with the American Dental Association, the Department of Defense and the Veterans Administration Dental Service.

Dr. Schoonover joined the staff of the Dental Materials Section in 1935, after

receiving his Ph.D. in chemistry from Princeton University. During 1944-45, he was at the Los Alamos Laboratory, and in 1945 returned to the National Bureau of Standards as chief of the Dental Materials Section.

PHYSICIAN'S CONTRIBUTION TO DENTISTRY CITED

Sigma Epsilon Delta's annual award for outstanding contribution to dentistry will be presented this year to a physician who is also a dental educator, John A. Kolmer of Philadelphia. He was chosen "for his untiring efforts to bring close cooperation between physicians and dentists."

A professor in the medical and dental schools of Temple University, Dr. Kolmer directs the school's Institute of Public Health and Preventive Medicine. He is a fellow of the American College of Dentists as well as the American College of Physicians and is an honorary member of the American Academy of Dental Medicine.

Dr. Kolmer will receive the award at Sigma Epsilon Delta's annual convention, May 23-25, at Wernersville, Pa. Inquiries regarding the convention may be addressed to Henry E. Rostov, 3655 Park Heights Avenue, Baltimore 15.

ORAL SURGEON ELECTED HOSPITAL CHIEF OF STAFF

Edward C. Thompson, chief of oral surgery at the Carle Memorial Hospital, Urbana, Ill., has received the distinct honor of being elected its chief of staff. The 115-bed general hospital is staffed by 25 specialists in various fields of medicine and surgery; ordinarily, the chief of staff of such a hospital would be a medical man.

Dr. Thompson is a graduate of Washington University dental school (St. Louis). Following postgraduate training, he joined the staff of the Carle Clinic and has practiced oral surgery in Champaign-Urbana for 14 years. Former president of his district dental society, he is also a member of the American Society of Oral Surgeons and the Chicago Society of Oral Surgeons, a fellow of the American College of Dentists and a diplomate of the American Board of Oral Surgery.

EASTMAN ALUMNI MEETING SET FOR APRIL 6 IN ROCHESTER

Former interns and clinical and research staff associates of the Eastman Dental Dispensary, Rochester, N.Y., have been invited to attend the second reunion of the newly organized Alumni-Alumnae Association to be held at the Dispensary on April 6. Details may be obtained by writing to the secretary, Hyman J. V. Goldberg, Eastman Dental Dispensary, 800 East Main Street, Rochester 3, N.Y.

HONOR RETIRING EDITOR OF DENTAL PUBLICATION

Jacob Shapiro, retiring editor of the New York University *Journal of Dentistry,* was honored January 31 at a dinner attended by 200 members of the University's Dental Alumni Association. Dr. Shapiro, who founded the publication 10 years ago, will leave his post on June 30.

SOCIETY FOR REHABILITATION OF CLEFT PALATE TO MEET

The American Association for Cleft Palate Rehabilitation will meet for its tenth annual convention April 25-26 in St. Louis. Sites of the conference will be the Chase Hotel, Washington University's dental and medical colleges, and Barnes and Children's Hospitals.

Dentists wishing to present papers, demonstrations or clinics may write to

Cecil R. Conroy, First National Bank Building, Belleville, Ill.

Further information regarding the program may be obtained from Herbert Koepp Baker, American Association for Cleft Palate Rehabilitation, Room 475, DMP Building, 808 South Wood Street, Chicago 12.

ACADEMY OF DENTAL MEDICINE TO MEET MAY 29-31

The American Academy of Dental Medicine will hold its annual meeting May 29-31 in Montreal, Que., Canada, according to William M. Greenhut of New York, national secretary.

A special pre-convention seminar of courses on dental pathology, oral medicine and psychosomatic factors of dental practice will be presented on May 28. The regular meeting program will include lectures and round table discussions on dento-medical subjects. All interested dentists are invited to attend.

Details of the program may be obtained by writing to Dr. Greenhut, 124 East 84th Street, New York 28.

ORAL SURGEONS TO ADDRESS ACADEMY OF ANESTHESIOLOGY

The International Academy of Anesthesiology will meet on May 21, at the Hotel Statler, New York City. An informal pre-meeting dinner will take place at 6:30 P.M.

The scientific session, scheduled to begin at 8:00 P.M., will feature papers by two well-known oral surgeons. They are Milton Travin of Brooklyn, who will speak on "Practical Considerations in General Anesthesia," and P. Philip Gross of Philadelphia, who will discuss "Anesthesia for Oral Surgery."

Information concerning membership in the Academy may be obtained from Irwin G. Tomack, 355 East 149th Street, New York 55.

VETERAN WOMAN DENTIST RETIRES AFTER 55 YEARS

The dean of women dentists in the United States, June Robinson of Bangor, Maine, has retired after 55 years of active practice. She was graduated from the University of Michigan School of Dentistry in 1897, and has practiced in New York City and Patten, Maine, as well as in Bangor. She was honored recently at a testimonial dinner by the Penobscot Valley Dental Association, of which she is a charter member and past president.

NORTHWEST DENTAL MEDICINE CONFERENCE TO MEET IN APRIL

The Northwest Conference in Dental Medicine is scheduled for April 13-17, 1952, at the Columbia Gorge Hotel, Hood River, Ore., according to Thomas D. Holder of Portland, chairman.

Details may be obtained by writing to the secretary, P. L. Meacham, 426 Medical Arts Building, Portland, Ore.

JOHN S. KELLOGG HONORED BY UNIVERSITY OF ILLINOIS

John S. Kellogg, who taught prosthetics at the University of Illinois dental school from 1921 until 1945, has been elected to the school's "Hall of Fame." Dr. Kellogg, now professor emeritus, joins six others whose portraits have been placed in the college. They are David Cottell, George Dittmar, Donald Gallie, Frederick Moorehead, Frederick Noyes, and Louis Schultz.

The Reader Comments

REPLY ON FLUORIDATION

Dr. Reuben Feltman asks, in the October 1951 issue of THE JOURNAL, whether the Newburgh-Kingston findings are not premature. It would seem, when an investigation of an important and diversified problem begins, and researchers estimate the time required to arrive at a solution, that it is natural for the investigators to estimate high, to cover any possible contingency. I believe that was the position of the U. S. Public Health Service when it started the Newburgh-Kingston study; the 10-year period was possibly a maximum requirement, since no one knew when results would be demonstrable.

The results, proving the fluorides to be effective and safe, were obvious, however, when the experiment was half over. Thereupon, the USPHS adopted the following resolution: "Using scientific methods and procedures, communities desiring to fluoridate their communal water supplies should be strongly encouraged to do so."

Contrary to Dr. Feltman's letter, the results of continuous usage are known—not only for periods of 10-20 years, but for entire lifetimes. In the August, 1950 issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, F. A. Bull of Madison, Wis., reported, "When it is realized that approximately 8,000,000 people in the U. S. have consumed water containing from 1 to 27 ppm fluorides throughout their lives, it can be assumed that the medical profession would have detected any systemic involvement if it had occurred." This, I think, is adequate proof that the fluoridation of drinking water to the extent of 1 ppm produces no deleterious systemic effects.

Is water the best medium? No other method of application is so simple, economical, unavoidable and universally applicable as water fluoridation. Furthermore, no patient education is required. Water is the least variable item in our diet, and as such, is the most practical dietary element with which to apply fluorides.

There is no adequate reason, based on sound scientific logic, that communal water supplies should not be fluoridated. The dental profession as a whole has actively encouraged communal water fluoridation, and individual dentists should do so for the betterment of all.

Walter J. Kent, D.D.S., Paterson, N. J.

ONE VIEWPOINT ON SOCIAL SECURITY FOR DENTISTS

It was with great disappointment that I read that, at the recent annual session of the American Dental Association, no positive action was taken in regard to the inclusion of dentists in the Old Age and Survivors Insurance provisions of the Social Security Act. The question was tabled until the next meeting, a year hence.

It is my firm conviction, judging both from what I read and from discussion, that the majority of dentists are in favor of inclusion. The American Dental Association is purported to be a democratic organization. Let it abide by the wishes of the majority. A simple and inexpensive means can be used to determine their wishes. A committee should be appointed for the sole purpose of determining this. It can be accomplished easily by having cards printed and sent to every dentist in the United States. On these cards should be the following: (1) Are you acquainted with the benefits of the Old Age and Survivors Insurance provisions of the Social Security Act? (2) Are you in favor of the inclusion of dentists under these provisions? (3) Are you opposed to inclusion? This would be a simple and definite way of ascertaining the wishes of the majority. After these signed cards are returned, the Committee of the House of Delegates of the American Dental Association would have no choice but to abide by the wishes of the majority.

I, for one, would like to be included under these benefits and I feel that the American Dental Association has no moral right to prevent my inclusion. Let each self-employed dentist who so desires, be allowed to do so. When a dentist is forced to retire from his profession for one reason or another, he should have some feeling of security. Most dentists, when they reach the age of 65, would like to be in a position to retire. With the savings he has been able to accumulate, plus the income from the Social Security benefits, he should be able to retire and live comfortably for his remaining years. Without the income from the Old Age and Survivors Insurance provisions, this would not be possible. I am not a lawyer, nor do I know the legal aspects of the dentist's rights, but I would be inclined to think that the dentist who has reached the age of 65 and who

would have been in a position to retire comfortably if he had the benefits from the Old Age and Survivors Insurance provisions of the Social Security Act, but was not included under the Act because the American Dental Association did not allow it, would be in a position to press the American Dental Association for the amounts he would have received through inclusion under the Social Security Act.

Legislators tell me that all the dentists need to do is to show them that the majority of dentists favor inclusion and it would be done.

Not only would I like this letter printed in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, but I would like to know if the American Dental Association intends to act on my suggestions.

Rubin Fabricant, D.D.S., Brooklyn

Dr. Fabricant apparently does not know that the Council on Insurance of the Association conducted a survey on this question in 1951 and found that nationwide opinion among members of the Association was about evenly divided. The House of Delegates based its decision on the results of this survey (see November 1951 JOURNAL, page 620), and on the fact that apparently dentists needed to acquaint themselves further with the subject. They recommended that discussion groups be formed in the constituent and component dental societies for that purpose. It is suggested that Dr. Fabricant join discussion groups in his local and state dental societies, which need the opinion of Dr. Fabricant and every other member in order to instruct delegates how to vote on the subject when it comes up for consideration at the ninety-third annual session in St. Louis next September.—*Editor*

THE "DECALCIFICATION POTENTIAL OF FOODS" AND CARIES

A prize article by Bibby, Goldberg, and Chen, entitled "The Caries Producing Potentialities of Foodstuffs," appearing in the May 1951 issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, has received a considerable amount of publicity in dental circles. In view of the public health implications of this article it is well to evaluate the experimental approach used by the authors.

The original objective of the article was to list carbohydrate foods according to their caries-producing potential. The selective recommendation of foodstuffs for caries prevention would then be justified. For this purpose methods were devised to measure the retention of foods in the mouth and the amount of acid formed from the food when incubated in saliva during intervals of 4 and 24 hours. The product of these two measurements was designated as the "decalcification potential" of the food.

$$\text{Acid produced in 4 and 24 hrs.} \times \text{Retention in mgs.} = \text{Decalcification potential}$$

This property was to serve as an index of the caries-producing capacity of a given food.

The decalcification potentials of a number of foods were determined according to the method described. According to these results, potatoes or bran cereal and milk should have a higher caries-producing potential than sugar or apple pie.

The authors, following their determination of the decalcifying potential of a number of foods, made an attempt to correlate this value with the caries-producing capacity of the food. The experiments on hamsters failed to relate definitely the decalcifying potential of foods with their caries-producing potentialities. It would appear, therefore, that in view of the fact that decalcifying potentials of foods have not been correlated with their caries-producing ability there seems to be little justification for the title, "Evaluation of the Caries-Producing Potentialities of Various Foodstuffs."

It is difficult, at present, to state the significance of the decalcifying potential index. The index is a product of food retention and acid production in the mouth. Tables 4, 5, 6, 7 and 8 suggest that it is primarily a function of food retention. The authors state that "the decalcification potentials of foods are influenced more by the wide range of retention figures than they are by acid production." Although retentivity of a food may be important in the production of dental caries, it falls short of being the major criterion by which the caries-producing potential of food may be assessed.

The significance of the amount of acid produced by a given food is difficult to assess. The acid produced was measured by incubation of the food with saliva for periods of 4 and 24 hours. The acid produced was the result of bacterial action upon monosaccharides and disaccharides that were found in the food and were made available by the action of salivary amylase and the enzyme maltase. Since most of the carbohydrate retained was in the form of starch, the action of amylase becomes very important in determining the amount of acid produced by bacterial activity. There appears to be little difference in the salivary amylase activity of caries-free and caries-active individuals (Bergeim and Barn-

field,[1] Hess and Smith[2]). Furthermore, the more rapidly fermenting sugars (monosaccharides and disaccharides) because of their solubility, and consequently low retentive figures, contributed much less to the acid-produced figure than starches. However, the role of monosaccharides and disaccharides appears to be more important in the production of dental caries than that of polysaccharides (Keyes,[3] McClure[4] and Stephan[5,6]). These factors may, in part, explain why the figures for acid formed from given foods varied and contributed much less to the decalcification potential index than retention.

The decalcifying potential index represents an important attempt at a development of a practical method of preventing dental caries. However, as determined, its relation to the caries-producing potentialities of food is to be viewed with some reservation.

Gordon Nikiforuk, Toronto, Ont., Canada

1. Bergeim, O., and Barnfield, W. F. Lack of correlation between dental caries and salivary amylase. J. D. Res. 24:141 (June) 1945.

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3. Keyes, P. H. Dental caries in the Syrian hamster. II: Preliminary study of the effect of three different rations on caries activity. J. Nutrition 32:525 (Nov.) 1946.

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5. Stephan, R. M. Hydrogen ion concentration of the dental plaque. J. D. Res. 17:251 (June) 1938.

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AN APOLOGY FOR THE TEETH

Controversy has recently brought to light a curious suggestion, advanced by some dentists perhaps inadvertently, as to the value of the teeth to general health. Unless the profession continue to extract teeth for the treatment of extraoral disease, these practitioners intimate, dentistry must revert to a mechanical art with a purely cosmetic purpose.

Such a belief assumes a completely negative attitude toward the value of the teeth. So regarded, the teeth are only a menace if diseased, and negligible if sound. Carried to a logical conclusion, this thinking should agree with that of zealots of bygone years who advocated the elimination of all permanent first molars as soon as they erupted, to make sure that sooner or later these teeth did not endanger the health of their possessor. The idea is not greatly different from that of the intemperate surgeon who would extirpate all tonsils and appendixes—except that the teeth can hardly be called vestigial organs. No one would deny that it is often necessary to remove teeth because they are diseased, but it does not follow that getting rid of such teeth is the only, or principal, function of the dentist.

Neither the dentist nor the layman will accept this altogether negative evaluation of the teeth. But not all dentists may be prepared to present an invincible defense of the virtues of the teeth, in face of their frequent frailties. It might be well to consider the teeth as standing before the bar of justice to give reason for their existence. What can their advocate say for them?

First of all is the esthetic claim, which has been spoken of somewhat slightingly. No one can doubt that throughout the historical era of mankind, from the time of the *Song of Solomon* to the present, glistening and shapely teeth have been prized for their adornment of the face and its expression. True, this virtue may be somewhat superficial. If, as some theorists have prophesied, Nature should in an eon or so reduce the human denture to non-existence, it is likely that the human countenance, edentulous, would appear just as attractive as it does today with a full complement of teeth. Man would simply revise his standard of beauty. In the meantime, the natural teeth remain a requisite to the good looks of human beings, especially during the most attractive and vigorous period of their lives. The disastrous effects of deformity on the social and psychic life of persons with irregular or malposed teeth or without the full complement of teeth are well understood today.

The teeth contribute to the cosmetic effect not merely through their appearance. By their presence alone or by their use, they promote the development of other structures of the face. The jaws owe their growth in part to the teeth. If full development is a necessary element in facial beauty, the teeth are essential.

The second positive merit of the teeth is their contribution to health and physical well-being. The teeth facilitate several functions of the body, especially mastication and speech. It is generally believed, and probably rightly, that the teeth, through mastication, contribute to good digestion by comminution and insalivation of the food. Upon this matter, not too much scientific information is available. There have been numerous studies dealing with the strength of the bite, the efficiency of comminution, and even the character of excretion when the food has been more or less thoroughly

manducated. But substantial evidence is largely lacking to show conclusively whether the preparation of food by the teeth has an important effect on the health.

The functions, as well as the anatomy, of the teeth have been curtailed in vertebrate history, especially as regards the prehensile functions in securing food, in mating, and in combat. And it might even be argued that as the food habits of man have changed within historic times, the teeth have become less essential, perhaps almost negligible, as masticatory organs. Yet it would be granted that the survival of a function such as mastication in association with digestion through many eras must indicate that it is valuable to the organism. The profession could urge its case for the teeth with greater assurance, however, if there were more scientific study on this point. In order to establish beyond doubt whether the teeth are valuable to the health of the child, the adult in middle life, and the aged, research should be undertaken to show exactly how effective normal mastication is in promoting digestion and consequent good health.

On the whole, it would appear that when the alternatives are presented quite bluntly, one must believe that the values of the teeth are positive, not negative, and that the most important duty of the dentist consists, not in removing teeth (necessary as that may be at times), but in preserving them.

The functions of the teeth are well known to the dentist and have been much discussed. A virtue of the teeth which has more or less escaped notice, or at least has not come in for much comment, is the humble merit of adding to the enjoyment of life. Wholly aside from considerations of health, the possessor of an efficient set of natural teeth undoubtedly savors his food with greater relish than does the wearer of the most faultless denture produced by art; and thus, through the psychic influences of taste, the juices of the mouth are stimulated and probably promote indirectly the health and well-being of the whole body.

George B. Denton, Ph.D., Chicago

Book Reviews

ORAL PHYSIOLOGY

By John T. O'Rourke, D.D.S., Sc.D. Edited by Leroy M. S. Miner, M.D., D.M.D., Sc. D., Dr. P. H. First edition. 333 pages. Index. Price $5. St. Louis, C. V. Mosby Co., 1951.

Oral Physiology was written as the result of a remark made by a professor of medicine, "Why do you bother with dental problems? Don't you know that teeth are trivial?" It reveals many important facts of which the average practitioner of dentistry is fully aware, but which somehow do not get over to the public. To the workers in the field of public health, and dentistry is one of the health professions, this book will supply the answer to many questions.

The 14 chapters which make up the book are entitled: "The Prevalence of Dental Disease"; "The Chief Function of the Mouth"; "Mastication"; "Mastication in Domestic Animals"; "Mastication in its Relation to Deglutition"; "Mastication in its Relation to Other Parts of the Alimentary Tract"; "Taste, Smell and Other Sensations in Relation to Mastication"; "Mastication and its Significance in Children"; "Geriatric Relationships"; "Saliva"; "Factors Which Interfere With Normal Mastication"; "Adaptations to Deficient Masticatory Function"; "Nutritional Implications"; "The Relation of the Physical Character of the Diet to the Health of the Supporting Tissues."

It is well-written, clear, concise and easy to read. It is recommended not only for the profession but for the student and the laity.

Harry Strusser

LABORATORY GUIDE IN DENTAL BACTERIOLOGY

By L. W. Hedgecock, Ph.D., and P. J. Ferrillo, D.D.S. 77 pages with illustration. Minneapolis, Burgess Pub. Co., 1950.

As a manual intended to serve as a guide in laboratory experiments which supplement formal lectures in dental bacteriology, this book should be useful. Its value will depend on the extent to which experiments are discussed in the lectures which precede the laboratory period. With few exceptions, the experiments are well-designed and they cover those considerations which are most important to an understanding of determinative bacteriology and laboratory technic.

In view of the current trends in teaching bacteriology, it is regrettable that so little emphasis has been placed on bacterial physiology and chemistry. Many simple metabolic experiments could be included to broaden the student's understanding of the dynamic aspects of microbiology.

The usefulness of the manual might be extended to the office of the dental graduate by including detailed descriptions for the preparation of the media and reagents employed and by expanding the brief discussions that appear before each experiment. An index of genera and materials would be helpful.

The book is printed in typewritten form, on one side of each page, allowing plenty of space for notations. The many errors in spelling are of little consequence and the frequent use of the word "media" for "medium" will annoy only the hypercritical reader.

Examination of this guide may provide other teachers with suggestions for improvement of their own laboratory courses.

ROENTGEN ANATOMY—ROENTGEN ANATOMÍA

By David Steel, M.D. 109 pages. Price $8. Springfield, Ill., Charles C Thomas, 1951.

This roentgen atlas is designed for quick reference. It is especially useful to those who must make occasional readings of extraoral and general skeletal roentgenograms. Dentists and students will find the identification of landmarks extremely useful. There are, for example, 63 landmarks identified in the lateral roentgenogram of the skull. Roentgenograms are illustrated of the adult only. The quality of reproductions are average. In common with most printed roentgenograms, the landmarks identified are usually visible. The roentgenograms are not reversed but are printed in the way in which they appear on viewing the original. For the Spanish speaking person, or a student of the Spanish language, a great asset of the atlas is the identification of all landmarks in both English and Spanish. The book is recommended for every serious student of roentgenology.

William Ward Wainwright

DOCTOR'S AND DENTIST'S TAX HANDBOOK

By Paul Gitlin. 198 pages. Price $4.95. New York, Prentice-Hall, Inc., 1951.

The size of this misnamed "handbook" on payment of taxes might lead one to suspect that most of it is devoted to highly unusual circumstances having little bearing on the tax problems of the average dentist. Actually, almost all of the book is worth reading by the average practitioner. This book is more helpful than the typical literature furnished by the Bureau of Internal Revenue because it explains not only the essentials but also the ramifications of the Internal Revenue Code, and it is tailored for the use of the dentist or physician.

Especially valuable are the sections on business and nonbusiness deductions. Other topics covered include accounting systems, different types of income, the declaration and payment of estimated tax, and claims for tax refund. In addition to the practitioner's own federal income tax, the book contains instructions on withholding employees' income and social security taxes.

The book is written concisely and is easy to read. Explanations of tax laws are, in many instances, further illuminated by examples.

E. Duane Moen

ATLAS OF HUMAN ANATOMY FOR THE ARTIST

By Stephen Rogers Peck. First edition. 272 pages with 1,000 illustrations. Index. Price $6. New York, Oxford University Press, 1951.

Of the several books which have appeared in recent years on anatomy for the artist this is easily one of the best. The author states in the preface that "this is a manual for the student [artist] who feels the need of exploring and memorizing human anatomy." In the opinion of this reviewer the Atlas is much more than this implies. Actually it covers the form and architectonic structure of the human body in a fashion which makes it a valuable reference work for the medical student and professional anatomist as well as the artist concerned with depicting the figure.

The Atlas is divided into seven main sections: Bones, Muscles, Surface Anatomy, Proportion, Equilibrium and Locomotion, Distinctions of Age, Sex and Race and Agents of Expression. The section on muscles contains a series of regionally arranged tables which give the origin, insertion, action and name derivation of each muscle. Other tables in the book cover racial characteristics, terminology and pronunciation of anatomic terms. The text which occupies only about 65 of the total pages is concise and clearly written. It is introduced only where word description is needed to supplement and reinforce the illustrations.

The atlas form being primarily a pictorial presentation of the subject must be judged by the quality of its illustrations. This volume can be given a high rating in this respect. The drawings, reproduced in line and half tone, were done by the author who is excellently qualified for the job. They are anatomically sound and have high artistic value. Thirty-two of the plates are photographic, mostly posed male and female figures placed in juxtaposition to drawings showing flayed figures in the same pose.

One might wish that some of the half-tone illustrations were not quite so black. This however is a minor criticism of a book which is otherwise so excellent.

T. S. Jones

NEW AND NONOFFICIAL REMEDIES

By Council on Pharmacy and Chemistry, American Medical Association. 782 pages. Index. Price $3. Philadelphia, J. B. Lippincott Co., 1951.

New and Nonofficial Remedies (N.N.R.) is a popular and widely used annual publication of the Council on Pharmacy and Chemistry of the American Medical Association. In the medical field, N.N.R. is comparable to *Accepted Dental Remedies.*

Dentists will be interested to know that all formerly accepted topical penicillin preparations have been omitted from N.N.R. Among the newly listed articles of special interest to dentists are hexachlorophene and several surgical soaps containing this germicide, the sweetening agent cyclamate sodium, and the antibiotics chloramphenicol, bacitracin and terramycin hydrochloride.

Pyridoxine (Vitamin B_6) hydrochloride is now described as having some value in the treatment of irradiation sickness. The human requirement is estimated tentatively as approximately one milligram per day. In the previous edition of N.N.R. pyridoxine was listed for purposes of standardization and experimentation only.

Many acceptable older drugs which were described in the 1949 and 1950 editions of N.N.R. are listed only in the general index to the 1951 edition. This editorial practice, which is to be continued, will result in emphasis on

descriptions of the useful newer drugs, concerning which current information is most needed by the practitioner.

N.N.R. is a useful reference book. The policy of annual revision assures the reader of relatively current information concerning drugs of established value. Its low price makes the purchase of a new book each year economically feasible.

HISTORY OF THE NORTHWEST INDIANA DENTAL SOCIETY, 1916-1950

Edited by Wayne K. Stoler, D.D.S. 30 pages. Valparaiso, Ind., Northwest Indiana Dental Society, 1951.

This small pamphlet presents the history of a local dental society, comprising the profession in five counties of northwest Indiana. Most of the events recounted are routine organization matters and do not greatly concern the profession as a whole. There is the usual emphasis on the names of officers and circumstances of seeming inconsequence to the outsider. Without regard to how well done this little work may be, it fulfills a legitimate purpose in stimulating and preserving the interest of the Northwest Indiana Dental Society in the solidarity of the local profession. Moreover, histories of this sort, taken in aggregate, furnish the basis for an adequate perspective on the development of organized dentistry in America and are of inestimable value to the general dental historian and to the archivist of the profession. Such records represent an activity which should be fostered by component and constituent societies and which should be encouraged by the American Dental Association.

George B. Denton

REPORT OF NEW GUINEA NUTRITION SURVEY EXPEDITION—1947

Edited by E. H. Hipsley and F. W. Clements. 308 pages with 433 illustrations. Index. No price listed. Sydney, Australia, A. H. Pettifer, 1950.

This report will be of interest and a challenge to all who hold the widespread belief that certain ways of life associated with civilization and over-refinement of foodstuffs are the cause of ill health in general and dental decay in particular; and that people living on native dietaries are relatively free from disease. It is clear from data in this book that a significant factor is the nature of any particular diet, whether it be native or otherwise. The report records evidence of how greatly native diets may differ. The field party which assembled the data included the following: a medical officer, parasitologist, nutritionist, two biochemists, agriculturalist, dental bacteriologist, sociologist, dental officer and photographer. They studied five villages in New Guinea, to help disclose the nature of the nutritional problem and to add information as to the extent of some problems of disease.

The staple food of each village studied was different, but it was largely vegetarian, lacking in dairy products and with only small quantities of meat and fish. There was complete absence of white flour and sugar.

A high rate of disease was detected. Part 8 presents the dental findings. Incidence of dental caries was higher than anticipated, but lower than observed in most civilized peoples. There was variation from village to village and in deciduous and permanent teeth. Fluoride was present in water samples, varying from 0.2 to 0.5 ppm, but there was no correlation with caries rate. Variation in forms of observed dental caries prompted the statement that there is need for more accurate definition of the criteria necessary for recognition of this disease. Incidence of malocclusion and periodontitis was high. Study of the details reported in this book is recommended to all persons concerned with any phase of dental disease.

Dorothea F. Radusch

A DOCTOR'S PILGRIMAGE

By Edmund A. Brasset, M.D. 256 pages. Price $3.50. Philadelphia, J. B. Lippincott Co., 1951.

City-bred and city-practicing doctors will read this saga of rough-and-tumble medical practice with shocked surprise, but there is much more than that described in this running account of a fledgling doctor's efforts to get started and the discouraging obstacles he overcame.

The author writes in a quietly humorous style that serves to lighten the grimness of many of his experiences and his desperate attempts to level the mountain of debt that overshadowed him so long but which was finally removed. Every professional worker will understand why, after finally attaining, many years later, a neurosurgical goal that had been his aim since interne days, the author voluntarily, even eagerly, gave this up and returned happily to his small town practice.

W. W. Bolton

Current Literature

BASIC CONSIDERATIONS UNDERLYING THE TREATMENT OF EXPOSED VITAL PULPS IN THE TEETH OF CHILDREN

Julien Reich. Austral. J. Den. 55:171, June, 1951.

The pathological considerations in instances of exposed dental pulp are outlined. A dynamic process is involved, the extent of which it is impossible to assess clinically by present day means. Treatment must necessarily be empirical. There are five results to be aimed at and four recognized methods of treatment. Since pulpotomy aims at the removal of any present infection and at the same time retains pulp vitality, it is the soundest method available at the present time. The 10 operative steps involved in pulpotomy are clinical examination; roentgenographic examination; determination of the state of the pulp; sedation and analgesia; isolation and sterilization of operative field; establishment of access to pulp; removal of coronal portion of pulp; control of bleeding; application of covering material and periodical checking of the case. Each step is discussed extensively, particularly the choice of covering material.

E. J. Fredrickson

SYMPOSIUM ON THE PREVENTION OF DENTAL DISEASE

J. Boyles. Brit. D. J. 91:83, August 21, 1951.

The geographic location and a complex domestic society are important factors contributing to dental disease. From these factors evolved the soft diet which has made caries one of the commonest human diseases. The physical and chemical means of tooth destruction are listed and the presence of bacteria in caries discussed. The dietary factor and the dissolving reaction of the highly refined carbohydrates on the calcium salts in the enamel are explained. Any microorganism can destroy the teeth but no single organism has been isolated as the contributing factor to decay.

The method of prevention of tooth decay is twofold. Since the deciduous teeth are formed in utero, the emphasis on antenatal nutrition cannot be overstressed. Prophylaxis, the correct use of toothbrush and the new ammoniated pastes and powders, and the neutralizing enzymes, vitamin K and sodium fluoride, are the more active means of prevention. The solution lies in a combination of the two. It is necessary to have in the first instance sound teeth and in the second place to keep them functioning with food which requires chewing and is nutritious, and to keep them thoroughly clean by thorough brushing after every meal with an appropriate substance.

E. J. Fredrickson

CLEIDOCRANIAL DYSOSTOSIS IN FOUR SIBLINGS

Henry C. Sandler. Am. J. Orthodont. 37:584, August, 1951.

The classic picture of cleidocranial dysostosis is described. Characteristically, it exhibits brachycephaly, clavicular aplasia, open fontanelles, wormian bones and hereditary transmission. Of interest to the dentist is the presence of supernumerary teeth, missing teeth, delayed eruption and multiple impaction.

The case histories of four siblings are reported. The view is supported that it is a defect occurring as a mutant and transmitted as a dominant mendelian factor. All siblings exhibit an Angle, Class III malocclusion, the maxilla being grossly underdeveloped. Coupled with the other usual dental characteristics, the prognosis for dental rehabilitation is poor.

Morton Heide

MATHEMATICS OF TOOTH DECAY

Jerome H. Svore and Arthur E. Williamson. Am. J. Pub. Health 41:1047, September, 1951.

This study was started in an attempt to prove or disprove the premise that, for school children using drinking water containing sodium fluoride, the DMF rates in the permanent teeth would increase with age in a straight-line fashion, graphically speaking. Using data from dental surveys conducted by the oral hygiene division of the North Dakota Department of Health, the authors made a statistical analysis and concluded that for any community school group having a common water supply with a fixed fluoride content, the trend line of the relationship between age and DMF

per child is in the form of a curve rather than a straight line. Other conclusions regarding the protection or preventive rates of various concentrations of sodium fluoride in drinking water are similar to those found in studies previously published.

Frank C. Cady

DENTAL DISEASE IN PARTS OF TRINIDAD AND BRITISH GUIANA (MARCH-APRIL 1948)

J. D. King and W. J. Martin. Brit. D. J. 40:63, February 6, 1951.

The effects of the gnawing of raw sugar cane on the gingival conditions, calculus deposition and dental caries in school children of Trinidad and British Guiana are discussed. The urban group in Trinidad had more gingival disease than the rural group which chewed cane and the rural group which did not chew cane had more gingival disease than the rural group which chewed cane. In British Guiana the group which did not chew cane had more gingival disease than the group which chewed it. A high degree of association was found between gingival disease and calculus deposition. No oral evidence of vitamin A and C deficiencies was found but 20 per cent of the British Guiana subjects showed clear signs of vitamin B_2 deficiencies. The incidence of gingival disease was higher in this deficiency group. Progressive loss of natural pigmentation of the gingiva was a prominent feature of periodontal disease in both East Indian and negro children.

A greater proportion of Trinidad urban children of 12 to 14 years of age were caries-free than either rural group. There was no significant difference between the rural groups who chewed or did not chew cane. There was a significantly greater incidence of caries in Trinidad (21.7 per cent) than in British Guiana (18.4 per cent). The survey showed a definite relationship between caries and a superficial hypoplasia in the first permanent molars. A comparison between carious lesions in the first and second molars indicated little difference in incidence although the extent of involvement was greater on the first molar than on the second. A possible explanation of this might be that the amount of vitamin D and calcium available is greater during infancy as indicated by the fact that the surface texture index was higher for the second molars than for the first. It is suggested that a calcium deficiency is common to both colonies. The effects of fluorine and dental treatments were not studied.

William A. Peterson

TISSUE METABOLISM AND PERIODONTAL DISEASE

Irving Glickman. J. Periodont. 22:41, January, 1951.

Although considerable knowledge of the nature of periodontal disease is available, a study of tissue metabolism in the periodontal region under physiologic conditions seems necessary in order to clarify just what happens in the tissues. Metabolism is concerned with the production of energy. The following laboratory methods may be used in the study of tissue metabolism: chemical studies of tissue, histochemical study, study of enzyme extracts, radioactive isotopes, and the determination of oxygen consumption.

Previous studies showed the following: the gingival phospholipid content is more closely allied to intestinal mucosa than to the skin; total lipid content of the gingiva more nearly resembles skin; the cholesterol content of gingiva is comparable to skin. The phosphatase content of blood and bone in instances of periodontal disease was increased over normal. Pathologic gingival tissue was deficient in glycogen when compared with normal tissue. The rate of protein putrefaction was more rapid in the saliva of patients with periodontal disease. No significant difference was found in the blood glucose content. Amyloid was found subjacent to the epithelial basal layer in 78 per cent of cases of amyloidosis. Histochemical studies of normal gingiva revealed a basement membrane between the connective tissue and the epithelium which consisted of a ground substance of insoluble highly polymerized carbohydrate-protein complex. The gingival connective tissue contains a carbohydrate-protein complex plus small amounts of glycoprotein residues and uronic acid derivatives. The connective tissue fibers were stained because of a glycoprotein structure. The epithelial cells contain a carbohydrate material in the cytoplasm. A glycoprotein network separates the epithelial cells. Radioactive phosphorus was more prevalent in the maxillary bone than in the mandibular bone and in the dentin of the root than in the crown.

Using the Warburg manometric technic, 86 gingival specimens from 46 patients (13 to 60 years of age) were studied for oxygen consumption. The specimens of marginal gingivae were placed in modified Ringer's solution (MPBR) buffered with phosphate (pH 7.5) until used. The average oxygen consumption (QO_2) for normal gingivae was 1.6 ± .37 which is comparable to that reported for human skin (1.48 ± .48). There was a tendency toward an increased oxygen consumption in gingiva with marked chronic inflammation

and a tendency toward a decreased oxygen consumption in essentially degenerated and necrotic gingivae.

A study was conducted correlating QO_2 and histologic changes in the course of healing following gingivectomy in the dog. An increased QO_2 noted on the fifth postoperative day was associated with an influx of inflammatory cells, epithelial proliferation and capillary formation. A further rise was noted from the fifth to the fourteenth day. A reduction in QO_2 occurred from the fourteenth to the twenty-first day in association with a reduction in connective tissue vascularity and cellularity, absence in fibroblastic activity, maturation of the epithelium and restoration of inflammation. The preoperative QO_2 level was maintained for the remainder of the 64 day experimental period.

The study shows that an increase of oxygen supply above the tissue requirements did not increase tissue usage, therefore discouraging the artificial introduction of oxygen to hasten gingival healing.

In a study using the Shorr stain on 215 female patients, a trend toward diminished keratinization was noted in normal gingivae with increasing age. This can be considered indicative of physiologic atrophy of the gingival epithelium arising from reduced metabolic activity of the individual cells. There is a need for continued studies of the metabolic processes of the periodontal tissues.

William A. Peterson

GEOGRAPHIC VARIATIONS OF DENTAL CARIES IN OREGON: V. DENTAL CARIES AMONG SCHOOL CHILDREN IN THE WILLAMETTE VALLEY REGION

Demetrios M. Hadjimarkos and Clara A. Storvick. Am. J. Pub. Health 41:1052, September, 1951.

This report deals with the prevalence of dental caries and some of the environmental factors which may influence it among school children of the Willamette Valley Region of Oregon. This region is west of the Cascade Mountains.

Data from the examination of school children in this region were compared with similar data obtained in counties of Oregon east of the Cascade range. Comparison of these data revealed definite differences in dental caries prevalence rates.

Dental caries rates among the children west of the Cascades are significantly higher than those living east of this mountain range. Investigation of environmental factors for an explanation of this regional difference in caries experience revealed that the fluoride content of drinking water, availability of dental service, and diet were not factors which could have been responsible for the differences.

The only significant factor was the inverse relationship between the prevalence of caries on the one hand and the amount of sunshine in combination with the altitude on the other. The coast and Willamette Valley where high caries rates were observed were characterized by fewer hours of sunshine and lower altitudes.

Frank C. Cady

T. WINGATE TODD: CATALYST IN GROWTH RESEARCH

Wilton Marion Krogman. Am. J. Orthodont. 37:679, September, 1951.

Dr. Todd brought to orthodontics the same concepts he brought to growth, generally: the dynamics of progressive unfolding, rather than the statics of the single biologic moment. He brought the idea of the passage of time, rather than an isolated observation, as the basis of diagnosis and the rationale of treatment. It is natural, therefore, that he brought to orthodontics the principle that the whole growing organism must be considered in treating one of its parts; that is, the dentofacial complex.

Growth, for Dr. Todd, was an intricate process. In 1932 he stated that it involved three concepts: (1) increase in dimensions: (2) change in proportions; (3) adjustment of parts. He went on to say that perhaps increase in dimensions might be considered as growth, per se, while change in proportions and adjustment of parts might be considered as development. To the whole he gave the name "developmental growth." In the same year, however, he went on to introduce a further idea, when he defined development as "modification of proportion with increasing maturity."

In his study of growth, Todd made some of his greatest contributions to orthodontics by his analysis of age-changes in the skeleton, (for example, his masterful summary, done in 1939, of aging in skeleton, locomotor system and teeth). His basic feeling, as stated in 1929, was that "bone . . . is a living tissue subject to constant change."

The problem of bone density concerned Todd very much. "When poor mineralization is present in the bones of the hand one may properly suspect it also in the jaws. It means that the process of remodeling of the bony alveolus, relied upon by the orthodontist for

establishment of the permanence in the new positions into which he has brought the teeth, is ineffective. As soon as the orthodontic appliance is removed the teeth will revert to their original position, or worse still, will be unstable in alignment and assume new positions of malocclusions."

The temporomandibular joint was approached by Todd almost wholly from a comparative morphologic viewpoint, as exemplified in his 1926 and 1930 papers, especially the latter.

The study of "bone age," "carpal age," "skeletal age," to use but a few synonyms, was the great theme of Todd's growth research, culminating in 1937 in his classic atlas of hand roentgenograms.

To the orthodontist the child's constitution, whether normal or abnormal (as he usually sees it), is important: it is a factor to be considered in the localized imbalance that has resulted in a malocclusion; it is a factor in the growth process that, it is hoped, may be an aid to therapy; it is a potential factor in the mineralization of the (alveolar) bone which is the locus of the movements caused by orthodontic stresses.

In the realm of heredity Todd made a real and enduring contribution by developing the "family-line" concept, of "tall," "average," and "small" growers.

Todd did more than contribute concept and philosophy; he contributed technic as well. Specifically, for the study of the growth of the craniofacial area he developed the widely known Reserve Craniostat, the forerunner of the cephalometer.

William F. Ford

FLUORIDATION KEYNOTED AT DENTAL CONFERENCE

Public Health Service, Federal Security Agency. Pub. Health Rep. 66:1171, September 14, 1951.

Fluoridation of public water supplies was the central theme of the fourth annual conference of state dental directors, held in Washington, D. C., June 6 to 8, 1951.

Francis A. Bull, director of dental education of the Wisconsin State Board of Health, told the conferees that the fluoridation program gives the dental profession its first opportunity to offer a preventive for the mass control of dental caries. He also stated that fluoridation should not be made the whole dental program.

Franz J. Maier, senior sanitary engineer of the Division of Dental Public Health, Public Health Service, said that before advocating fluoridation of any particular water supply in a state, the state dental director should be prepared to answer three questions: Will it do any good? Will it do any harm? How much will it cost?

It was pointed out that studies show 65 per cent less dental decay in children born and reared in areas where fluoride naturally is present. There also are more caries-free children.

Seven points are emphasized in the establishment and operation of local fluoride programs as well as five points which are the responsibility of engineers assisting communities to plan their fluoridation layouts. These points include who should initiate the program, the cost, local plans, periodic evaluation, examinations, the engineering phase, persons capable of operating a water plant and the equipment involved in a fluoridation program.

It was stated, that of the three, sodium silicofluoride provides fluoride at about a third of the cost of hydrofluosilicic acid, and at about half the cost of sodium fluoride.

W. W. Demeritt

SOME RECENT EXPERIMENTAL INVESTIGATIONS

J. D. King. Brit. D. J. 91:86, August 21, 1951.

A number of long term investigations, histological, clinical, biochemical and bacteriological, which are being conducted through the Medical Research Councils' Dental Research Unit and Kings College Hospital, London, are discussed. Particular emphasis is laid on the experimental approach to the various problems involved.

Following a series of experiments begun on ferrets in 1932, attention was drawn to a form of periodontal disease which, in clinical and histological features, closely simulated that associated with calculus and food impaction in man. How prevention and cure were effected is related and two types of root cavities in ferrets suffering from periodontal disease are discussed. With the introduction of the golden hamsters as an experimental animal, the discussion is carried a step further and shows the relation of a certain diet to periodontal lesions. There is a discussion of cavities in the molar teeth of hamsters in which diet figures prominently and a detailed comparision is made between the animal and human material.

E. J. Fredrickson

Deaths

Bayley, Warren C., Haverhill, Mass.; died November 26.

Bayne, Arthur, La Salle, Ill.; Dental School, Northwestern University, 1898; died December 7.

Beach, John R., Clarksville, Tenn.; School of Dentistry, Vanderbilt University, 1892; died November 10; aged 78.

Belscamper, Vernon W., Lancaster, Wis.; Dental School, Marquette University, 1923; died January 5; aged 51.

Bolin, James C., Dyer, Ind.; Chicago College of Dental Surgery, Loyola University, 1918; died January 18, 1951.

Burg, Martin F., Brooklyn; School of Dental and Oral Surgery, Columbia University, 1927; died November 5; aged 45.

Burk, Joseph R., New York; New York College of Dentistry, 1919; died December 13; aged 59.

Campbell, Ralph D., Frederick, Md.; Baltimore College of Dental Surgery, University of Maryland, 1924; died December 3; aged 51.

Campbell, Thomas K., Chillicothe, Mo.; Western Dental College, Kansas City, 1905; died November 20; aged 66.

Cann, Horace F., Monroe, La.; Atlanta Dental College, 1901; died December 11; aged 73.

Clevenger, John W., Mitchell, S. D.; Dental School, Northwestern University, 1901; died January 4; aged 74.

Conger, Elijah H., Las Vegas, Nev.; Louisville College of Dentistry of Centre College, 1905; died December 2; aged 73.

Copenhaver, E. Marcellus, Marion, Va.; Baltimore College of Dental Surgery, University of Maryland, 1892; died November 5.

Cornick, Nim, Batesville, Miss.; Louisville College of Dentistry of Centre College, 1906; died November 9; aged 65.

Cosgriff, Richard J., Alameda, Calif.; College of Dentistry, University of California, 1924; died December 15; aged 58.

Crooks, William B., Washington, Iowa; Dental School, Northwestern University, 1900; died December 10; aged 76.

Davidson, Lorin E., Tarzana, Calif.; Chicago College of Dental Surgery, Loyola University, 1931; died December 7; aged 47.

Denny, Guy W., West Point, Ga.; Atlanta-Southern Dental College, 1919; died April 30.

Dixon, Preston F., Tulsa, Okla.; College of Dentistry, Ohio Medical University, 1903; died September 1.

Donaldson, Lawton L., Quitman, Ga.; Atlanta Dental College, 1912; died November 26; aged 62.

Dober, Siegmund A., New York; New York College of Dentistry, 1906; died September 14.

Donahoe, John D., Sioux Falls, S. D.; Chicago College of Dental Surgery, Loyola University, 1902; died November 2; aged 72.

Drury, Adelbert N., Winthrop, Mass.; Dental Department, Baltimore Medical College, 1900; died November 13; aged 72.

Dunn, Roberdeau M., Tulsa, Okla.; School of Dentistry, Vanderbilt University, 1919; died January 1; aged 56.

Ely, Arch E., Oklahoma City, Okla.; died October 5.

Fischer, Henry L., Waterbury, Conn.; Baltimore College of Dental Surgery, 1909; died December 8; aged 72.

Franke, Archibald D., Canby, Ore.; died December 4.

Frost, Maxwell H., New York; New York College of Dentistry, 1923; died December 10; aged 55.

Gale, Melvin E., Hollywood, Calif.; Dental School, Northwestern University, 1904; died August 23.

Gray, Clarence A., Washington, D. C.; College of Dentistry, Howard University, 1894; died November 9; aged 82.

Hamlet, William M., Jamaica, N. Y.; died November 20.

Hanschen, Peter H., Oakland, Calif.; College of Physicians and Surgeons, San Francisco, 1914; died October 22.

Hartman, Alfred P., Winston-Salem, N. C.; Atlanta-Southern Dental College, 1927; died November 29; aged 51.

Hayden, Phillip O., Brunswick, Mo.; Western Dental College, Kansas City, 1919; died November 20; aged 58.

Heck, Joachim A., St. Louis; School of Dentistry, St. Louis University, 1917; died December 1; aged 67.

Herzog, Joseph A., Butte, Mont.; College of Dentistry, Creighton University, 1923; died December 9; aged 53.

Hiatt, Newton W., Marion, Ind.; Kansas City Dental College, 1889; died December 6.

Hook, Beverly B., San Francisco; College of Dentistry, University of California, 1908; died December 23; aged 65.

Hoot, William I., Rochester, N. Y.; School of Dentistry, University of Pennsylvania, 1909; died November 28; aged 63.

Huff, Chester H., Nashville, Tenn.; School of Dentistry, Indiana University, 1928; died November 21.

Huston, Earl J., Hot Springs, Ark.; Chicago College of Dental Surgery, Loyola University, 1905; died September 2.

Jennings, Edward J., Trenton, N. J.; School of Dentistry, University of Pennsylvania, 1919; died December 12; aged 59.

Johnson, Delzo, Cave City, Ark.; died September 16.

Johnson, Richard H., Milwaukee; Dental Department, Milwaukee Medical College, 1905; died December 5.

Jordan, Irvine G., Dallas, Texas; College of Dentistry, Baylor University, 1922; died December 15; aged 55.

Kabell, Carl F. W., Chicago; died January 8.

Kocher, Herbert J., St. Petersburg, Fla.; College of Dentistry, New York University, 1904; December 5; aged 79.

Korssell, Harold M., Josephine, Ala.; died January 17, 1951.

Krowitz, Joseph I., Van Nuys, Calif.; School of Dentistry, University of Pennsylvania, 1915; died November 25; aged 60.

Lambertus, John A., Eganville, Ontario, Canada; Faculty of Dentistry, University of Toronto, 1898; died May 28.

Lindstrom, Carl, Ocean Springs, Miss.; Chicago College of Dental Surgery, Loyola University, 1898; died September 6; aged 78.

Lineberger, Henry O., Raleigh, N. C.; School of Dentistry, University of Louisville, 1914; died December 7; aged 60.

MacBrair, Henry C., Middletown, N. Y.; Baltimore College of Dental Surgery, 1890; died December 28; aged 82.

MacCraw, Robert M., St. Paul; College of Dentistry, University of Minnesota, 1935; died December 8; aged 42.

Matlack, Harry C., Cincinnati; Dental Department, Ohio College of Dental Surgery, University of Cincinnati, 1893; died October 5.

McCracken, Thomas J., Portland, Ore.; Dental School, Northwestern University, 1906; died December 4.

McCuller, Charles T., Mansfield, La.; School of Dentistry, Tulane University, 1912; died November 22; aged 62.

McDonald, George T., Jamestown, N. D., College of Dentistry, Ohio Medical University, 1901; died December 5; aged 80.

McVay, Augustus B., Galesburg, Ill.; Dental School, Northwestern University, 1902; died October 27; aged 77.

Murphy, John L., San Francisco; College of Physicians and Surgeons, San Francisco, 1925; died February 16, 1951; aged 55.

Northrup, William F., Cleveland Heights, Ohio; College of Dental Surgery, University of Michigan, 1911; died December 28; aged 66.

Oakley, Earl C., Moravia, N. Y.; School of Dentistry, University of Buffalo, 1913; died November 29; aged 63.

Osborne, Joseph D., Atlanta, Ga.; Atlanta Dental College, 1911; died October 25; aged 65.

Patterson, Franklin W., Springfield, Mo.; Interstate Dental College, Kansas City, 1896; died November 20; aged 77.

Peck, Houghton W., Beloit, Wis.; Dental School, Northwestern University, 1898; died November 29; aged 78.

Pelton, William H., Fostoria, Ohio; College of Dentistry, Ohio Medical University, 1904; died October 5.

Perkins, Benjamin L., Buffalo; School of Dentistry, University of Buffalo, 1927; died November 27; aged 53.

Phillips, David W., La Jolla, Calif.; Dental School, Northwestern University, 1916; died December 29; aged 58.

Phillips, Sidney, Hollywood, Calif.; College of Dentistry, New York University, 1896; died October 12.

Philps, Robert W., Challis, Idaho; died August 26.

Prendergast, Frank P., St. Paul; College of Dentistry; University of Minnesota, 1903; died December 12; aged 75.

Purdy, Arthur G., Carbondale, Ill.; died in September; aged 84.

Race, Arthur W., La Junta, Colo.; School of Dentistry, University of Denver, 1919; died September 4.

Rea, William P., Memphis, Tenn.; School of Dentistry, Vanderbilt University, 1913; died October 20; aged 62.

Rice, Lee L., Bridgeport, Ill.; Louisville College of Dentistry of Centre College, 1905; died September 29; aged 74.

Richards, George L., Dayton, Ohio; died September 21.

Robaszkiewicz, Charles, Plymouth, Pa.; Department of Dentistry, Medico-Chirurgical College of Philadelphia, 1910; died in May.

Robinson, Fred M., St. Paul; Dental School, Northwestern University, 1905; died November 14; aged 69.

Rokeach, Fanny, Brooklyn; died January 8, 1951.

Schmidt, Harry H., Springfield, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1902; died November 19; aged 71.

Sears, George, New Bedford, Mass.; Central College of Dentistry, Indianapolis, 1900; died November 18; aged 73.

Seffer, Rainer O., Concord, Calif.; College of Physicians and Surgeons, San Francisco, 1919; died February 23, 1951; aged 60.

Shontz, Benjamin F., Seattle; School of Dentistry, North Pacific College of Oregon, 1930; died December 9.

Simpson, J. Menzo, Willoughby, Ohio; died November 1.

Smith, Arthur, Berea, Ohio; School of Dentistry, Western Reserve University, 1903; died November 14.

Smith, Raymond C., Tyler, Texas; College of Dentistry, Baylor University, 1936; died November 21; aged 42.

Smith, Stanley J., Waukegan, Ill.; Dental School, Northwestern University, 1934; died November 25; aged 40.

Spahn, Charles A., Newark, N. J.; Baltimore College of Dental Surgery, University of Maryland, 1903; died December 9; aged 72.

Spahn, Philip T., New York; School of Dentistry, University of Buffalo, 1926; died December 4; aged 65.

Stevenson, George A., Harvey, Ill.; Dental School, Northwestern University, 1923; died January 1; aged 57.

Strayer, Edward R., Philadelphia; School of Dentistry, Temple University, 1925; died December 16; aged 54.

Swain, Earl G., Streator, Ill.; Dental School, Northwestern University, 1905; died August 16.

Sweet, Will S., Long Beach, Calif.; Dental School, Marquette University, 1906; died November 29; aged 73.

Sykes, S. Claude, Elkton, Md.; Baltimore College of Dental Surgery, University of Maryland, 1890; died October 30.

Tarbell, Leon C., Smyrna Mills, Maine; School of Dentistry, Temple University, 1911; died September 19; aged 63.

Thatcher, Joseph W., Burlingame, Calif.; School of Dentistry, Temple University, 1894; died October 5; aged 92.

Tillson, Frank C., Burbank, Calif.; College of Dentistry, University of Southern California, 1921; died December 20.

Tilton, Charles H., Penns Grove, Pa.; School of Dentistry, Temple University, 1899; died October 6.

Topliff, Ray F., Postville, Iowa; Dental School, Northwestern University, 1906; died November 21; aged 67.

Wallentine, Nathaniel, Long Beach, Calif.; died September 12.

Walsh, Patrick B., Hudson, Mass.; Dental School, Tufts College, 1899; died in November.

Walton, Thomas B., Washington, Ga.; Atlanta Dental College, 1897; died November 9.

Wells, Albert D., Skaneateles, N. Y.; School of Dentistry, University of Pennsylvania, 1897; died November 14; aged 77.

Westcott, George W., Chicago; College of Dental Surgery, Northwestern University, 1891; died October 31.

Wheeler, Edward E., Los Angeles; died October 23.

Wightman, Frank L., Beverly Hills, Calif.; College of Dentistry, University of Southern California, 1929; died December 28; aged 50.

Wilkinson, Charles W., Altadena, Calif.; College of Dentistry, University of Iowa, 1907; died December 27; aged 73.

Williams, Curran M., Birmingham, Ala.; Birmingham Dental College, 1908; died November 13; aged 70.

Willis, Roy M., Magnolia, Ark.; School of Dentistry, Vanderbilt University, 1916; died November 25; aged 61.

Willman, Jerome E., Weslaco, Texas; Chicago College of Dental Surgery, Loyola University, 1900; died December 19; aged 72.

Wright, Walter H., New York; School of Dentistry, University of Pittsburgh, 1917; died December 31; aged 58.

Wyatt, Eugene R., Newbern, Tenn.; Dental School, Northwestern University, 1901; died November 27.

Zeithammel, Edward W., Cedar Rapids, Iowa; College of Dentistry, University of Iowa, 1909; died December 7; aged 68.

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Third Annual Session	Sept. 8-11, 1952	St. Louis
Ninety-Fourth Annual Session	Sept. 28-Oct. 1, 1953	Cleveland
Ninety-Fifth Annual Session	Nov. 8-11, 1954	Miami

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	Apr. 14, 15	Birmingham	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Alaska	July 14-17	Anchorage	R. A. Smithson	Box 1293, Anchorage
Arizona	Apr. 24-26	Phoenix	E. M. Scott	17 E. Welden Ave., Phoenix
Arkansas	Apr. 6-9	Little Rock	D. M. Hamm	White Bldg., Clarksville
California	Apr. 21-23	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	May 5-7	Los Angeles	C. A. Moss	1401 S. Hope St., Los Angeles
Colorado	Oct. 5-8	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut	May 21-23	Bridgeport	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 14, 1953	Wilmington	J. J. Ficca	2130 Lancaster Ave., Wilmington
District of Columbia	Mar. 9-12	Washington	K. H. Wood	202-1835 Eye St., N. W. Washington
Florida	Apr. 20-23	Jacksonville	T. A. Price	808 Congress Bldg., Miami
Georgia	Nov.	Savannah	J. M. Heard, Jr.	803 Persons Bldg., Macon
Hawaii	June 11-14	Honolulu	J. H. Dawe	810 N. Vineyard St., Honolulu 17
Idaho	June 30-July 2	Sun Valley	F. E. Carpenter	123 Main Ave., W., Twin Falls
Illinois	May 19-22	Springfield	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 12-14	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 5-7	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 11-14	Topeka	F. A. Richmond	861 Brotherhood Bldg., Kansas City
Kentucky	Mar. 31-Apr. 2	Louisville	A. B. Coxwell	1976 Douglas Blvd., Louisville
Louisiana	Apr. 17-19	Shreveport	J. S. Bernhard	2515 Line Ave., Shreveport
Maine	June	Rockland	S. Gower	Skowhegan
Maryland	May 4-7	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 4-7	Boston	H. E. Tingley	12 Bay State Road, Boston
Michigan	Apr. 21-23	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota			C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	June 9-12	Biloxi	H. M. Campbell	102 Professional Bldg., Tupelo
Missouri	Sept. 12	St. Louis	R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 8-10	Butte	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 12-14	Omaha	F. A. Pierson	1112 Federal Securities Bldg., Lincoln
Nevada	June	Reno	R. La Fond	Medical Dental Bldg., Reno
New Hampshire	June 29-July 1	Bretton Woods	F. E. Williams	814 Elm St., Manchester
New Jersey	Apr. 23, 24	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	Apr. 14-16	Roswell	J. S. Eilar	Suite 7, Medical Arts Square, Albuquerque
New York	May 12-15	Syracuse	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 11-14	Pinehurst	B. N. Walker	Liberty Life Bldg., Charlotte
North Dakota	May 15-17	Minot	J. H. Lunday	302 Black Bldg., Fargo
Ohio			E. G. Jones	185 E. State St., Columbus
Oklahoma	Apr. 20-23	Oklahoma City	R. C. Calkin	109½ W. Oklahoma, Guthrie
Oregon	Mar. 3-5	Portland	H. C. Fixott, Jr.	308 Selling Bldg., Portland
Panama Canal Zone			O. Slavin	Box 415, Balboa
Pennsylvania	May 4-7	Reading	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico			R. Carrasquillo	Box 214, Rio Piedras

State	Date	Place	Secretary	Address
Rhode Island			E. L. Bessette	1745 Broad St., Cranston 5
South Carolina		Greenville	J. R. Owings	7 Medical Court, Greenville
South Dakota	May 18-20	Mitchell	E. W. Elmen	Sioux Falls
Tennessee	May 5-7	Memphis	W. L. McCulley	Brown Bldg., Cleveland
Texas	Apr. 28-May 1	Fort Worth	W. Ogle	3607 Gaston Ave. Medical Bldg., Dallas
Utah	June 11-14	Zion National Park	E. O. Thompson	915 Medical Arts Bldg., Salt Lake City
Vermont	May	Woodstock	W. J. Reardon	Rutland
Virginia	Apr. 28-30	Virginia Beach	J. E. John	804 Medical Arts Bldg., Roanoke
Washington	May 15-17	Seattle	C. R. Flood	1130 Medical-Dental Bldg., Seattle
West Virginia	July	White Sulphur Springs	A. B. Drake	508 West Virginia Bldg., Huntington 1
Wisconsin	Apr. 14-17	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming		Casper	T. J. Drew	State Capitol Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

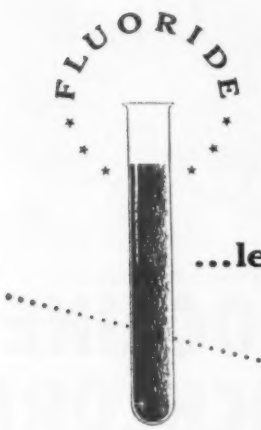
State	Date	Place	Secretary	Address
Alabama	June 16	Birmingham	M. D. Edwards	132 Adams Ave., Montgomery
Alaska	July 7-11	Anchorage	J. H. Geyer	P. O. Box 915, Juneau
Arizona	Aug. 11-16	Florence	R. K. Trueblood	25 N. Second Ave., Glendale
Arkansas	June 23-26		H. O. Weatherly	205 Halter Bldg., Conway
California			K. I. Nesbitt	507 Polk St., San Francisco 2
Colorado	June 23-27	Denver	C. K. Phillips	724 Republic Bldg., Denver 2
Connecticut			C. G. Brooks	302 State St., New London
Delaware	June 16-18*	Wilmington	P. K. Musselman	143 W. Main St., Newark
District of Columbia			W. M. Falls	1801 Eye St., N. W., Washington 6
Florida	July 7-12*	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia			S. H. Yarbrough	Medical Arts Bldg., Columbus
Hawaii			H. L. Houvener	427 Dillingham Bldg., Honolulu
Idaho	June 23	Boise	W. K. Adams	718 Arthur St., Caldwell
Illinois			W. A. McKee	503 Wood Bldg., Benton
Indiana	June 17-20*	Indianapolis	C. A. Frech	504 Broadway, Gary
Iowa	May 19-23	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Kansas			G. L. Teall	Box 71, Hiawatha
Kentucky	June 2-5	Louisville	R. I. Todd	Western Union Bldg., Richmond
Louisiana			A. R. deNux	Marksville
Maine			R. A. Derbyshire	Box 387, Skowhegan
Maryland	June 9-11	Baltimore	H. Levin	3429 Park Heights Ave., Baltimore 15
Massachusetts	June 23, 24, 26, 27‡ June 25-27‡‡	Boston	J. C. Wilson	State House, Boston 33
Michigan	Jan. 27-Feb. 2	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
Minnesota	June 8-14		F. A. Larson	1632 Washington St., N. E. Minneapolis
Mississippi	June 17-19*	Jackson	J. C. Boswell	508 Lamar Life Bldg., Jackson
Missouri			R. R. Rhoades	Central Trust Bldg., Jefferson City
Montana			V. J. Quinn	Box 865, Helena
Nebraska	June 3-7	Lincoln	H. E. Weber	1210 Federal Securities Bldg., Lincoln
Nevada			G. C. Steinmiller	Masonic Temple, Reno
New Hampshire	June 20, 21		D. J. Freese	4 Wall St., Concord
New Jersey			W. A. Wilson	150 E. State St., Trenton 8
New Mexico	June 23-26	Santa Fe	J. J. Clarke, Sr.	Artesia
New York			D. W. Beier	23 S. Pearl St., Albany 7
North Carolina			F. O. Alford	1109 Liberty Life Bldg., Charlotte 2
North Dakota	July 7-11	Fargo	A. B. Crabtree	Ellendale
Ohio	June 23-27	Columbus	H. B. Smith	322 E. State St., Columbus
Oklahoma			J. B. Cole, Jr.	706 Asp, Norman
Oregon	June 9-12*		F. L. Utter	506 Pioneer Trust Bldg., Salem
Pennsylvania	June 19-21** June 21†† June 23-25†	Philadelphia	R. E. V. Miller	Northampton National Bank Bldg., Easton
		Philadelphia and Pittsburgh		
Puerto Rico		Santurce	L. C. Coll	Box 3717, Santurce
Rhode Island			F. M. Hackett	267 Academy Ave., Providence
South Carolina	June 26-28		T. C. Sparks	1315 Pickens St., Columbia
South Dakota			K. A. Stormo	Lead
Tennessee	June 9-13	Memphis	F. S. Maxey	804 Bennie Dillon Bldg., Nashville 3
Texas	June 15-21‡ Apr. 26, 27‡‡	Dallas	R. T. Weber	312 Capital National Bank Bldg., Austin
Utah			F. E. Lees	324 State Capitol Bldg., Salt Lake City

State	Date	Place	Secretary	Address
Vermont	June 23-25	Montpelier	F. A. Reid	Windsor
Virginia			J. M. Hughes	715 Medical Arts Bldg., Richmond 19
Washington			J. B. Kiefer, Jr.	510 Cobb Bldg., Seattle
West Virginia	June 23-25	West Liberty	C. A. Laughlin	613 Prunty Bldg., Clarksburg
Wisconsin	June 16-20*	Milwaukee	S. F. Donovan	Tomah
Wyoming	June 23-25	Casper	W. A. Hocker	212 O & S Bldg., Casper

*Dentistry and dental hygiene.
**Dental clinical examinations.
†Dental and dental hygiene written examinations.
††Dental hygiene clinical examinations.
‡Dental examinations.
‡‡Hygienists' examinations.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
Academy of Denture Prosthetics	Mar. 16-22	New Orleans	I. L. Furnas Secy.	928 Silverado St., La Jolla, Calif.
American Academy of Dental Medicine	May 29-31	Montreal, Canada	W. M. Greenhut Secy.	124 E. 84th St., New York 28
American Association of Dental Examiners	Sept. 5, 6	St. Louis	C. A. Bumstead Secy.	924 Stuart Bldg., Lincoln, Neb.
American Association of Industrial Dentists	Apr. 22-24	Cincinnati	E. R. Aston Secy.	1400 N. Cameron St., Harrisburg, Pa.
American Association of Orthodontists	Apr. 21-24	St. Louis	G. R. Moore Secy.	919 Oakland Ave., Ann Arbor, Mich.
American Board of Orthodontics	Apr. 16-20	St. Louis	C. E. Martinek Secy.	661 Fisher Bldg., Detroit 2
American Board of Pedodontics	Aug. 4-7	San Francisco	R. L. Ireland Secy.	College of Dentistry, University of Nebraska, Lincoln, Neb.
American Dental Society of Europe	July 15-18	London, England	F. D. Derrick Secy.	140 Park Lane, London W. 1, England
American Society for the Advancement of General Anesthesia in Dentistry	Mar. 24	New York	M. H. Feldman Exec. Secy.	730 Fifth Ave., New York 19
American Society of Oral Surgeons	Oct. 8-11	New Orleans	R. F. Whalen Exec. Secy.	1112 E. Clay St., Richmond, Va.
Canadian Dental Association and British Columbia Dental Association, Golden Jubilee	June 15-18	Vancouver, B. C., Canada	C. M. Whitworth Secy.	Joint Convention Committee, Canadian Dental Association, 218 Medical-Dental Bldg., Vancouver, B. C., Canada
Council on Dental Education, Division of Aptitude Testing	Mar. 7, 8		S. Peterson Secy.	222 E. Superior St., Chicago 11
Eleventh International Dental Congress	July 19-26	London, England	G. H. Leatherman Hon. Secy.	35 Devonshire Place, London W. 1, England
International Academy of Oral Dynamics	Mar. 9-12	Washington, D.C.	J. J. Greeves Pub. Chm.	1801 K St., N.W., Washington 6, D.C.
Iowa Conference in Oral Surgery	Mar. 31, Apr. 1	Iowa City	J. G. Whinery, Chm.	State University of Iowa Hospitals, Iowa City
National Board of Dental Examiners	Apr. 7, 8 Dec. 1, 2		S. Peterson Secy.	222 E. Superior St., Chicago 11
National Health Council	Mar. 13, 14	New York	T. D. Dublin Exec. Dir.	1790 Broadway, New York 19
Northeastern Society of Orthodontists	Mar. 3, 4	New York	O. Jacobson Secy.	35 W. 81st St., New York
Northwest Conference in Dental Medicine	Apr. 13-17	Hood River, Ore.	P. L. Meacham Secy.	426 Medical Arts Bldg., Portland, Ore.
Southeastern Society of Oral Surgeons	Apr. 11, 12	Hollywood, Fla.	W. Matthews Editor	1922 Tenth Ave., S., Birmingham, Ala.
Southern Society of Orthodontists	Aug. 10-13	Asheville, N. C.	F. P. Bowyer Secy.	608 Medical Arts Bldg., Knoxville, Tenn.
Thomas P. Hinman Mid-Winter Clinic	Mar. 23-26	Atlanta, Ga.	R. D. Robinson Gen. Chm.	832 Candler Bldg., Atlanta, Ga.



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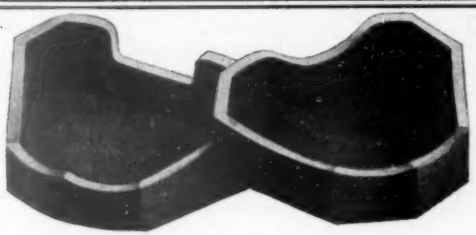

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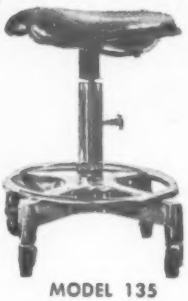

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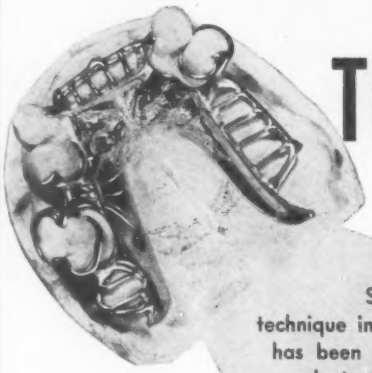

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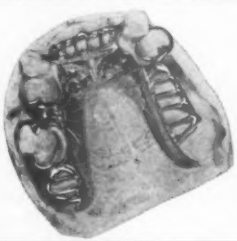

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1. Maynard, L. A. The role and efficiency of animals in utilizing feed to produce human food. J. Nutrition *32*:345 (Oct.) 1946.

2. Supplement for 1949 to Consumption of Food in the U. S., 1909-48, U.S.D.A. Misc. Pub. 691, Washington (Sept.) 1950.

3. Christensen, R. P. Efficient use of food resources in the United States. U.S.D.A. Tech. Bull. 963, Washington, 1948.

The presence of this seal indicates that all nutrition statements in this advertisement have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

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Surgical Preparation of the Mouth
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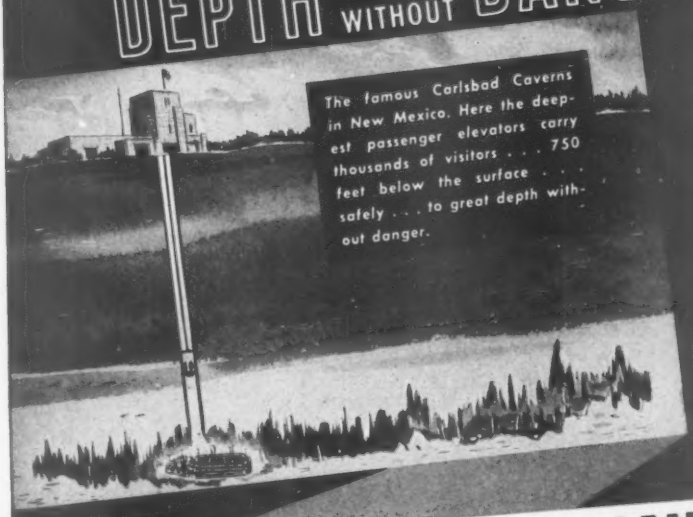

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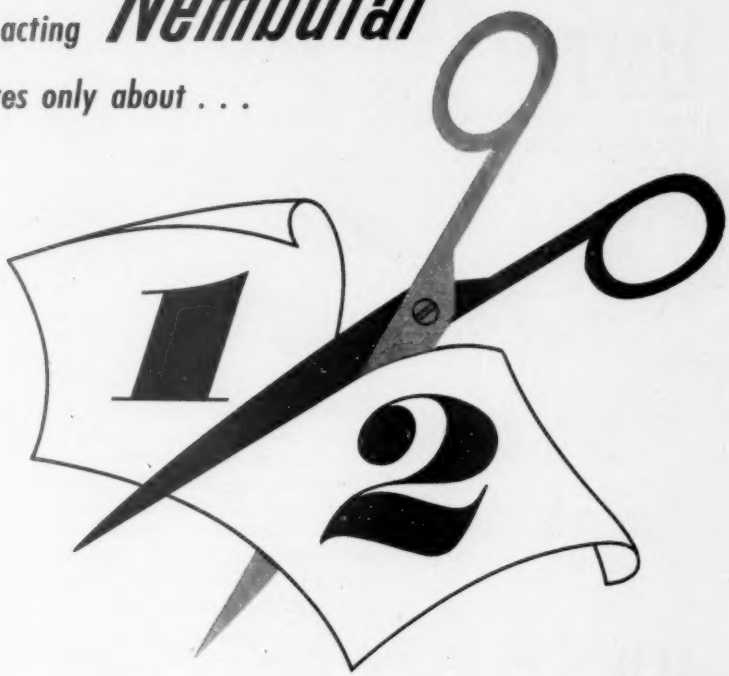

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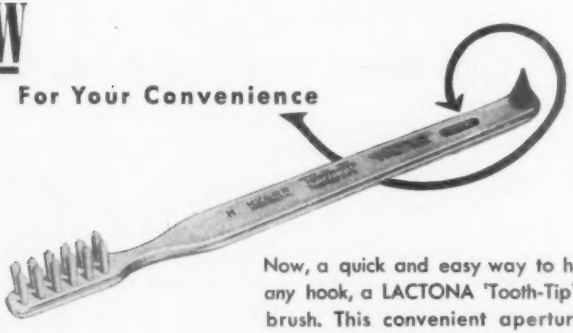

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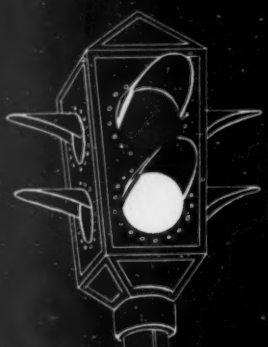

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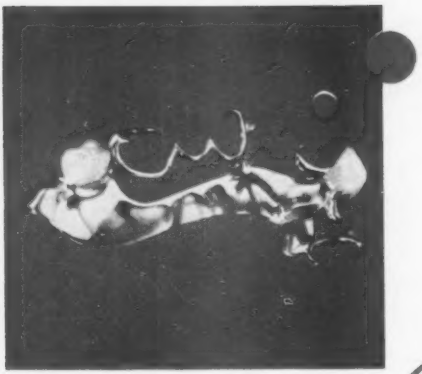

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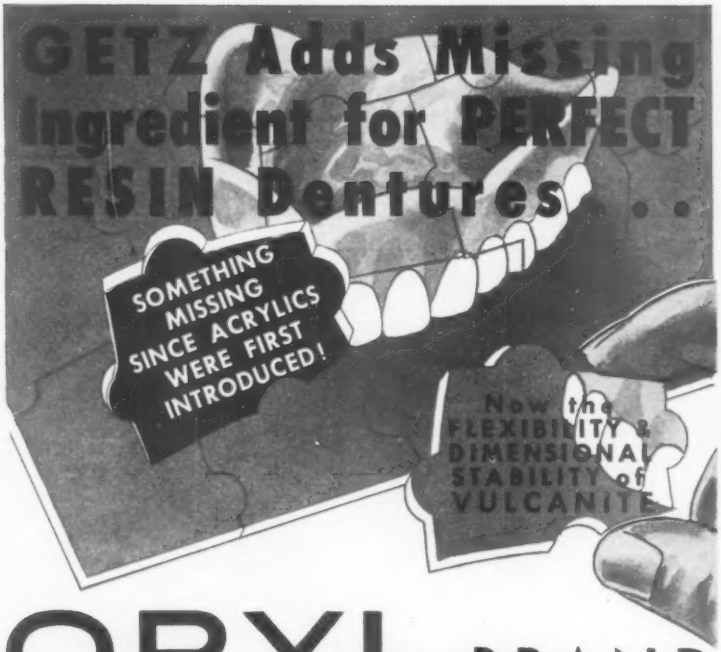
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Disability need not be incurred in line of duty—benefits from the beginning day of disability

PHYSICIANS CASUALTY ASSOCIATION
PHYSICIANS HEALTH ASSOCIATION

49 years under the same management

400 FIRST NATIONAL BANK BUILDING — OMAHA 2, NEBRASKA

PATIENTS DIFFER

. . . so does their reaction to anesthesia

BE SAFE! CHOOSE THE CORRECT FORMULA FROM

Graham's 7 Anesthetics

Accepted Council on Dental Therapeutics American Dental Association

Cat. #	
PT25	PROCAINE HCl 2% — TETRACAINE HCl .15% with Phenylephrine HCl 1:2500
65	PROCAINE HCl 4% with Epinephrine 1:65,000
NS	PROCAINE HCl 4% with Phenylephrine HCl 1:2500
50	PROCAINE HCl 2% with Epinephrine 1:50,000
2NS	PROCAINE HCl 2% with Phenylephrine HCl 1:2500
25	PROCAINE HCl 2% with Epinephrine 1:25,000
0	PROCAINE HCl 2% Plain

PROCAINE HCl 2% with Epinephrine 1:50,000 (Graham Catalog #50)

For routine use
For simple extractions
For removal of deciduous roots in children
For women in weakened condition

For 30 years, this formula has been regarded as the standard anesthetic in routine interventions. *Graham* prepares this formula with precision and care in one of America's newest and most modern laboratories.

All Graham cartridges are metal-capped to prevent leakage, and vacuum-packed to assure freshness. You will find Graham Anesthetics at leading dealers. For free samples of any two Graham formulae, write to:

Graham Chemical Co.
SPRINGFIELD GARDENS, N. Y.

Date_____

GRAHAM CHEMICAL CO., Springfield Gardens, N. Y.

Please send the following TWO Graham Anesthetics free of charge. (Please check)

Catalog #PT25___ #65___ #NS___ #50___ #2NS___ #25___ #0___

My dealer is _____

My name is _____

Address _____

City _____ Zone_____ State_____

dp three-in-one cream has no equal

for non-pressure or pressure technics

CONSISTENCY CAN BE REGULATED TO SUIT ANY TECHNIC

Not sticky

Not messy

Pleasant to patient

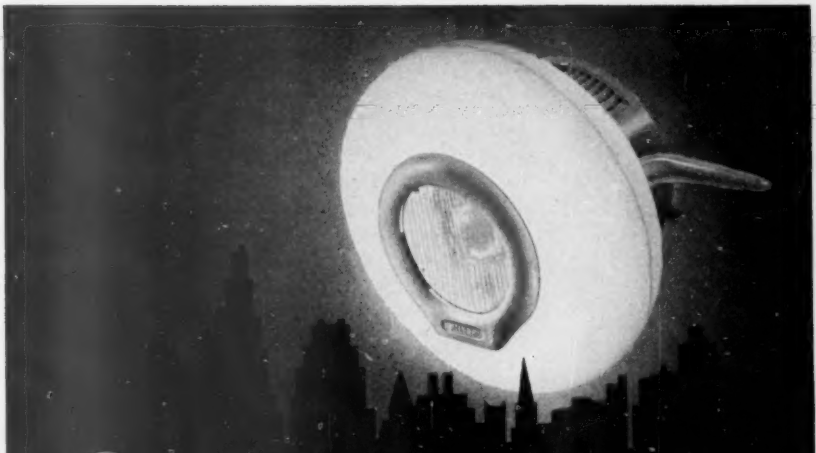
Pleasant to use

Elastic — permits withdrawal over any undercuts

Retains most minute detail

TRY IT!
order from your dental dealer now

dental perfection co.
543 West Arden Avenue • Glendale 3, Calif.



Bring Sunshine into Your Office

DURING THESE DARK DAYS WITH A

Ritter FUL-VUE LIGHT

CONSTANT DAYLIGHT IN YOUR OPERATING ROOM

With the soft, diffused light of the circline fluorescent tubes, your patients are able to view their restorations in a true light. Your skill receives greater appreciation. In this light you are better able to match teeth. And, you enjoy greater ease and comfort working in good daylight conditions.

COMPLETE ORAL CAVITY ILLUMINATION

The color-corrected light forms an even rectangle to completely illuminate the oral cavity. With far less eye fatigue, you see more clearly the intra-oral field of operation. The concentrated beam produces a clear, white light free from glare, free from excessive heat. The operating spot framed by a halo of fluorescent light gives greater patient comfort.

Samophen

ANTISEPTIC SOAP

Regular use of SAMOPHEN Antiseptic Soap makes and keeps your hands surgically clean. Wash your hands today, and they'll be cleaner tomorrow, too.

SAMOPHEN does everything other soaps can do—and, because it contains 3% hexachlorophene, gives you these outstanding advantages:

- 36% more effective* than 2½% tincture of iodine
- Cumulative antibacterial action from routine use
- Non-irritating, non-sensitizing, non-toxic

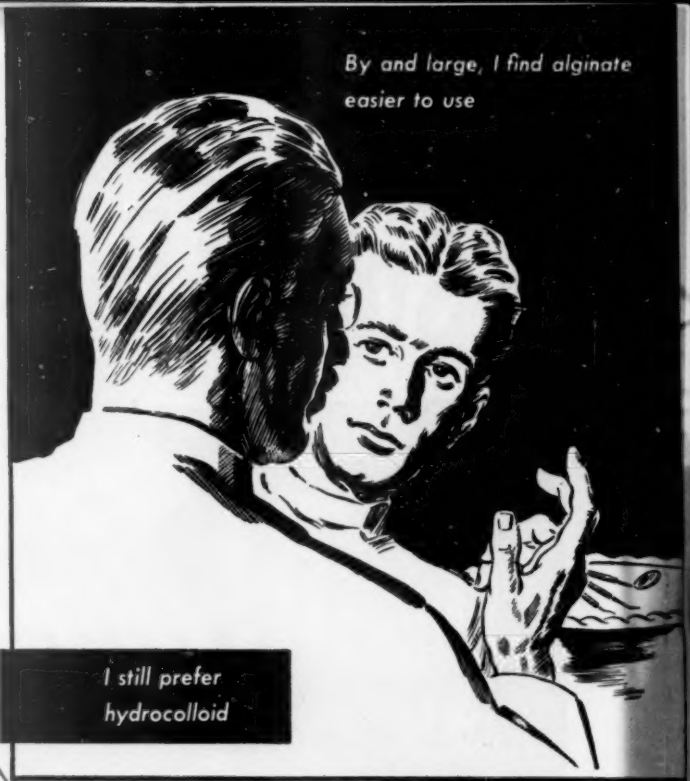
SUPPLY: Individually wrapped four and one-half ounce cakes in boxes of twelve. Ask your dealer about the attractive quantity rates.

For your copy of the brochure presenting clinical and laboratory evaluation of SAMOPHEN, please write to JOHNSON & JOHNSON Dental Division, New Brunswick, New Jersey.

Recognized by patients · Relied on by dentists

*Tested against mixed cultures of Staph. aureus, Strep. hemolyticus and E. coli.

Speaking of impression materials...



TAKE YOUR CHOICE, DOCTOR!

Accurate impressions can be made with either hydrocolloid or alginate . . . depending on your manipulative preference *and* on the brand you select. And results point unmistakably to the wisdom of choosing Zelex or Dentocoll.

MICROMETER proves the accuracy of models made from impressions of Zelex and Dentocoll.

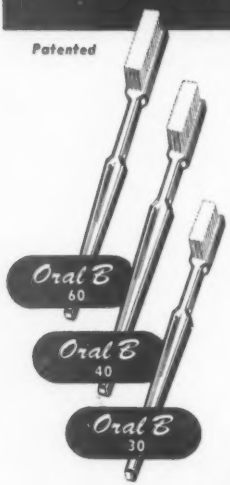
ZELEX OR DENTOCOLL

for accurate, one-piece impressions

For modern materials call on *Caulk* Milford, Delaware

Try This Softer Brush!

Patented



3 SIZES AND ONLY 1 TEXTURE

*Oral B 60 shown above

Feel the Difference!

Depress the bristles and let the Oral B tell it's own story. Feel the 2500 softer, finer bristles*—3 times *more* than an ordinary brush . . . and many *more* than any similar brush. The result is a superior cleansing job plus gingival massage without injury For many years, Professional men recognized the need for this type of brush. Then Oral B *pioneered* the field to bring you the answer. Try it yourself and *feel* the difference!

Write today for complete information

Oral B® Company

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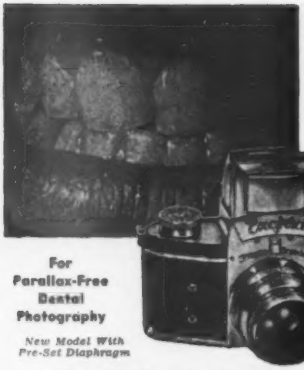
DEPT. C, SAN JOSE 13, CALIF.



Close-Up of Teeth Taken With Exakta "VX"

For Parallax-Free Dental Photography

New Model With Pre-Set Diaphragm

1952 EXAKTA—MODEL VX

35-mm. Single Lens Reflex Camera

For photographing conditions before and after treatment cavities, inlays and bridgework, and for recording and for demonstrating oral treatment to patients. The indispensable aid of the progressive dentist! With f2.8 Zeiss Tessar "T" Coated Lens with Pre-Set Diaphragm Control **$269.50**
Penta Prism Eye Level Reflex Viewfinder **50.00**
Extension Tube Set **24.00**
Microscope Adaptor **29.50**

FREE—Write Dept. 300 For Free Descriptive Booklet "C" on Camera & Accessories and Brochure On Close-Up Technique With Exakta.

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PROFESSIONAL PROTECTION
EXCLUSIVELY
SINCE 1899

specialized service
assures "*know-how*"

See for yourself!

How Denicotea filters cigarettes!

THE EVIDENCE IS CRYSTAL CLEAR

BEFORE USE: *The Denicotea Crystal Filter is pure white*

AFTER USE: *Denicotea filter turns black as it absorbs nicotine and tars.*

One look at a used Denicotea filter is more convincing than a thousand words.

You can actually *see* the frightening amount of irritants it removes from cigarette smoke.

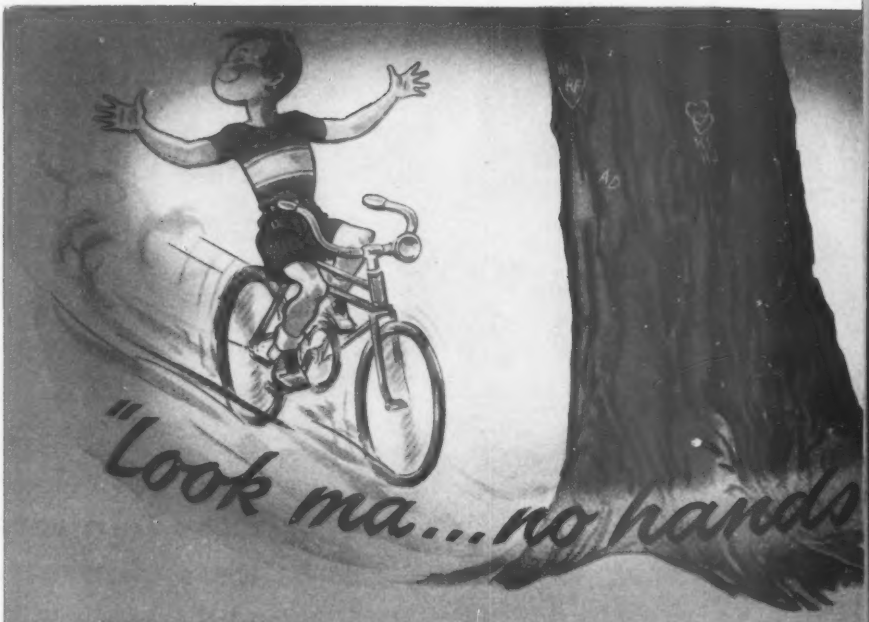
Obviously, that tarry stuff is better in the filter than in nose, throat—*and lungs.*

It stands to reason that cigarettes—*any cigarette*—is *less* irritating when filtered the Denicotea way.

What's more, you'll notice the difference in the whiteness of your patients' teeth and the condition of their gums.

PROFESSIONAL ½ PRICE INTRODUCTORY OFFER:
Send for your Denicotea Holder, **$1.25** postpaid (regularly $2.50)
Longer, Lady Denicotea Holder, **$1.75** postpaid (regularly $3.50)
Write to
Alfred Dunhill, Dept. D3 660 Fifth Ave., New York 19

dunhill DE·NICOTEA *FILTER* HOLDER



The novice bicycle rider may be "riding for a fall" unless he uses the handle bars. And the novice denture wearer often finds it wise also to use every facility available to enable him to increase his expertness in manipulating the new denture.

The soft, resilient cushion provided by Wernet's Powder reduces discomfort . . . improves retention and stability . . . helps eliminate awkwardness . . . builds up self-confidence. In cases of structural abnormalities Wernet's Powder helps compensate for the anatomical difficulties and promotes greater usefulness of the denture and greater comfort. Such patients appreciate both the dentist's skill in designing a perfectly fitting denture and his recommendation of Wernet's Powder to minimize their handicaps.

WERNET DENTAL MFG. CO., INC., JERSEY CITY 2, N. J.

Speeds the Mastery of the Denture

WERNET'S POWDER

WERNET DENTAL LORE

MARCH 1952

According to modern dental scientists, the teeth of Americans are decaying six times as fast as dentists can fill them, working at top speed. This is largely attributed to the high national consumption of sugar: 100 lbs. average per year, as compared with 20 lbs. 100 years ago. Experimental evidence indicates that sugar is equally cariogenic, whether as natural sugar or refined.

• • •

Children can't vote! According to a spokesman for the British Dental Association, dental care for over 90% of Britain's school children is being entirely neglected under the government health program, because of the undue emphasis on prosthetic service for adults. To date 7,000,000 sets of dentures have been made for Britain's total population of 48,000,000.

• • •

One of the early great families in 19th century American dentistry were the Parmlys, notable also in Europe. In two generations 18 Parmlys became practicing dentists, the most famous being Dr. Eleazar Parmly, who (with brother Levi S.) added greatly to the meager stock of contemporary dental literature.

• • •

More dentists are interested in prosthetics today than any other phase of dental practice, if one is to judge by the findings of a recent survey, asking dentists to indicate the subjects most favored as topics for dental meeting clinics. In the replies, prosthetics led by a wide margin, with oral surgery and operative work running second and third in preference.

• • •

Do women have more teeth than men? Do people with the most teeth live longer? Such used to be the common belief, held even by that early comparative anatomist Aristotle.

• • •

To obtain the exact type of karaya gum needed as a base for Wernet's Powder, entails the meticulous processing and exacting control of imported crude gum, yielding a product finally that is superior to all N.F. requirements for appearance, solubility and purity.

FREE PROFESSIONAL SAMPLES

WERNET DENTAL MFG. CO., INC., Jersey City 2, N. J.

Please send me professional samples of Wernet's Powder.

DR._____

ADDRESS_____

CITY_____ ZONE____ STATE_____

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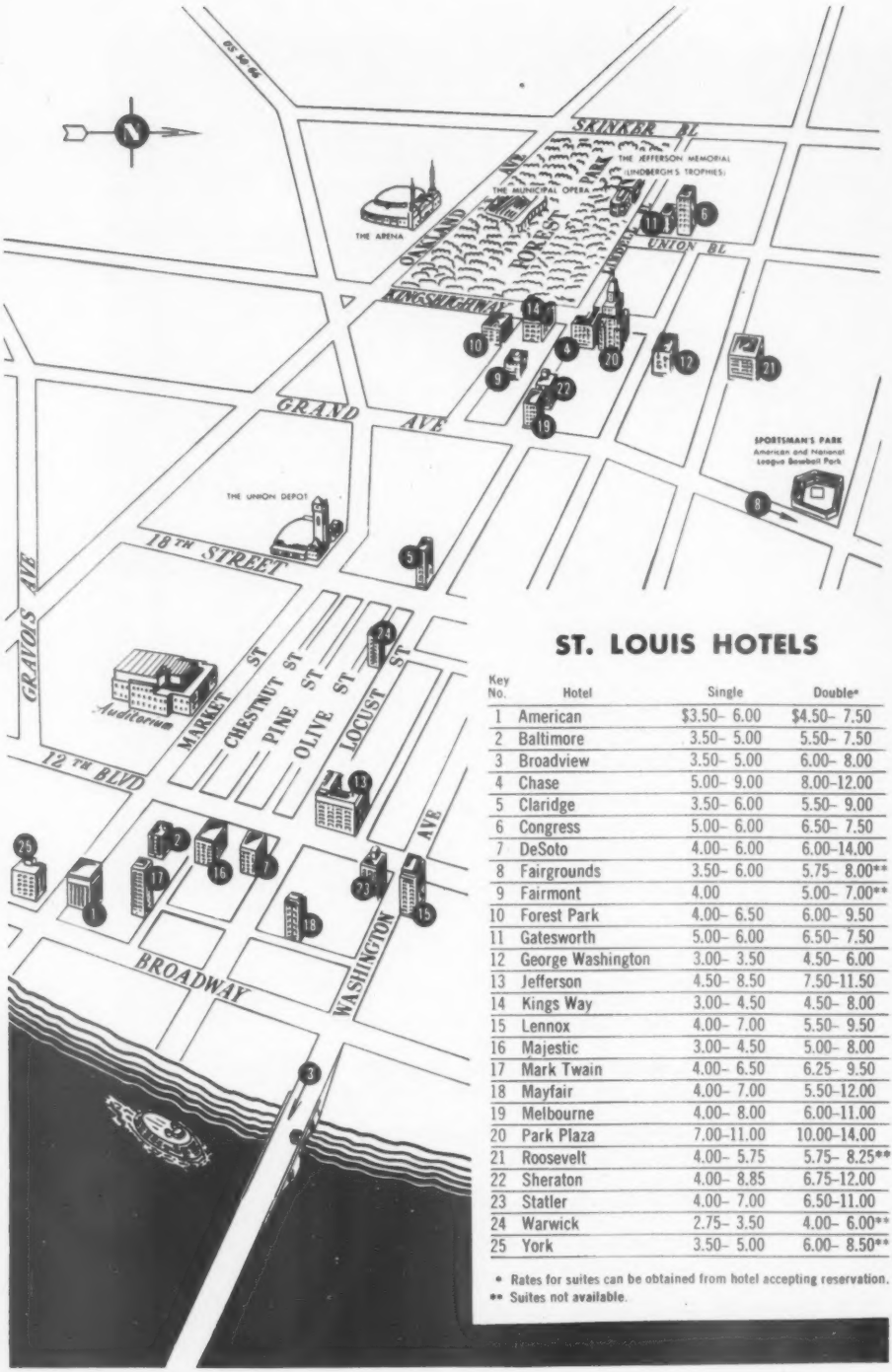

ST. LOUIS HOTELS

Key No.	Hotel	Single	Double*
1	American	$3.50– 6.00	$4.50– 7.50
2	Baltimore	3.50– 5.00	5.50– 7.50
3	Broadview	3.50– 5.00	6.00– 8.00
4	Chase	5.00– 9.00	8.00–12.00
5	Claridge	3.50– 6.00	5.50– 9.00
6	Congress	5.00– 6.00	6.50– 7.50
7	DeSoto	4.00– 6.00	6.00–14.00
8	Fairgrounds	3.50– 6.00	5.75– 8.00**
9	Fairmont	4.00	5.00– 7.00**
10	Forest Park	4.00– 6.50	6.00– 9.50
11	Gatesworth	5.00– 6.00	6.50– 7.50
12	George Washington	3.00– 3.50	4.50– 6.00
13	Jefferson	4.50– 8.50	7.50–11.50
14	Kings Way	3.00– 4.50	4.50– 8.00
15	Lennox	4.00– 7.00	5.50– 9.50
16	Majestic	3.00– 4.50	5.00– 8.00
17	Mark Twain	4.00– 6.50	6.25– 9.50
18	Mayfair	4.00– 7.00	5.50–12.00
19	Melbourne	4.00– 8.00	6.00–11.00
20	Park Plaza	7.00–11.00	10.00–14.00
21	Roosevelt	4.00– 5.75	5.75– 8.25**
22	Sheraton	4.00– 8.85	6.75–12.00
23	Statler	4.00– 7.00	6.50–11.00
24	Warwick	2.75– 3.50	4.00– 6.00**
25	York	3.50– 5.00	6.00– 8.50**

* Rates for suites can be obtained from hotel accepting reservation.
** Suites not available.

Hotel Reservation Application . . .

93rd Annual Session
American Dental Association
September 8-11, 1952
St. Louis, Missouri

A. D. A. HOUSING BUREAU

911 Locust Street, Room 406, St. Louis 1, Missouri

INSTRUCTIONS:

Reservations for hotel accommodations may be secured by completing this application and mailing it to: A.D.A. Housing Bureau, 911 Locust Street, Room 406, St. Louis 1, Missouri.

Be sure to indicate your arrival time in St. Louis. Reservations will be held only until 6 p.m. of the day you indicate when you will arrive in St. Louis. Failure to notify the hotel of any last minute change in your arrival time may result in cancellation of the reservation.

Names of all persons who intend to occupy the accommodations must be listed on the application.

List four choices of hotels.

Confirmation will be sent indicating which hotel has accepted the reservation.

Write the A.D.A. Housing Bureau in St. Louis if you wish to cancel the reservation or make any change in your reservation and NOT the hotel to which you were assigned.

(Please print or type) A.D.A.

Applicant:

Name _____

_____
(Street address) (City) (Zone) (State)

Arrival in St. Louis _____ a.m. / p.m. Leaving _____

Accommodations:

Hotel _____ (First choice) Hotel _____ (Third choice)

Hotel _____ (Second choice) Hotel _____ (Fourth choice)

☐ Single occupancy, rate to range from $_____ to $_____ per day.

☐ Double occupancy, double bed, rate to range from $_____ to $_____ per day. } 2 names must be listed below

☐ Double occupancy, twin beds, rate to range from $_____ to $_____ per day. }

☐ Suite of _____ rooms, including parlor, rate to range from $_____ to $_____ per day.

Occupants: (use an extra page for listing additional names if necessary)

Room will be occupied by:

_____
(Name) (Address) (City) (State)

_____
(Name) (Address) (City) (State)

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means "original, before all others" . . .

FR X-Ray solutions were first in concentrated liquid form (more than 15 years ago). And through continuing research and improvement have maintained their years-ahead advantages.

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means "finest, better than all others" . . .

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*The results of a recent survey indicates that these are the qualifications dentists feel are "musts" for the anesthetic of their choice. These specifications are perfectly met with

Oradent CHEMICAL CO., INC.

DIVISION OF:

ANESTHETICS

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POLIDENT
-now germicidal!

absolutely safe and harmless

Now at last, scientific research has succeeded in giving effective germicidal action to POLIDENT, the popular "soak-and-rinse" denture cleanser. This significant advance in denture cleansing has been achieved by the incorporation in Polident of a new ingredient, INTHOL, which exerts prompt, positive germ-killing action against oral organisms, yet is non-irritating and completely harmless to the patient and denture.

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Kills germs quickly
. . . dentures are fully sanitized.

Destroys odors
. . . dentures are odorless and "fresh".

Enhances cleansing penetration
. . . dentures are spotlessly clean.

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POLIDENT *with* INTHOL®

More Dentists Recommend POLIDENT than any other Denture Cleanser

FREE

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Please send me Professional samples of the new Polident with Inthol.

Dr._____
Please Print

Address_____

City_____ State_____

F-32

WHY TOLERATE INTERNAL STRAINS AND DENTURE DISTORTIONS

. . . When you can be SURE with

Palatex-51

REG. U.S. PAT. OFF. AND IN FOREIGN COUNTRIES

COLD CURE DENTURE ACRYLIC

Boiling and cooling acrylics create internal strains that result in some denture distortion and weakening, no matter how stable the base.

All *approved* cold-cure denture materials produce stronger, more accurate dentures — for they eliminate the one big disadvantage of boiling. But PALATEX '51 provides a *plus* — finer particle size. This 200 mesh powder (so fine it escapes the naked eye) imparts even greater strength . . . better flow . . . and a tissue-like look that defies detection.

Dentists and Laboratories alike have been quick to recognize the great advantage of the cold cure denture materials. Why not avail yourself of the very best on your next case — use PALATEX '51.

Available in light, medium, dark pink — and clear

Complies with A.D.A. Specification No. 12

Manufactured by ROCKLAND DENTAL CO., INC.

J·B·M CO. INC.

Sole Distributor

THE J. BIRD Moyer CO., INC.

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April 7-8, 1952
(Applications must be received by March 8, 1952)

December 1-2, 1952
(Applications must be received by Nov. 4, 1952)

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ARIZONA	NEBRASKA
CONNECTICUT	NEVADA
ILLINOIS	NEW HAMPSHIRE
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KANSAS	OREGON
KENTUCKY	PENNSYLVANIA
LOUISIANA	RHODE ISLAND
MAINE	SOUTH DAKOTA
MARYLAND	VERMONT
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AMERICAN DENTAL ASSOCIATION
222 EAST SUPERIOR ST. -:- CHICAGO 11, ILLINOIS

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In vacuum firing the internal and external gases created at the high temperatures at which

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trubyte Bioform® teeth

the first "vacuum fired porcelain" teeth

JUDGE FOR YOURSELF THE STRENGTH AND DENSITY OF TRUBYTE BIOFORM TEETH.

Grind a **Trubyte Bioform Tooth.** Feel its texture. Then examine the ground surface of the tooth under magnification and compare it with the ground surface of any other tooth. After you have polished the tooth with a rag wheel and pumice, again observe it under magnification.

SEE FOR YOURSELF HOW REALLY DENSE ARE TRUBYTE BIOFORM TEETH.